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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Our Growing Coal Tar Industry

WHEN consideration is given to the magnitude of the coal tar industry, the multitude of products derived from the crude substance, and the marvellous transformations which have been wrought by chemists with the main derivatives, no explanation is required for our issue this week of a special number which deals in the main with coal tar products. If one bears in mind the substances which have been isolated from the raw material and the applications to which they have been turned it is difficult to think of few branches of chemical industry which are not in some way or another dependent upon the primary work of the tar distiller. It is generally supposed that the ordinary crude material, as obtained by recognised systems of high temperature coal carbonisation, contains more than 200 definite chemical compounds, of which about 120 have been definitely isolated; and some idea of the magnitude of the industry can be gathered from the fact that in this country alone the amount of tar distilled annually is well over a million and a quarter tons.

It is not, perhaps, necessary to dwell upon the opportunities which in this great industry were ours some years ago, but which we failed to turn to account. In the early days of the industrial development of coal tar products Great Britain played a prominent part, but she failed to retain the lead she had gained, so that in many of its finer aspects the industry almost became a German monopoly. That unpleasant fact, occasioned largely as a result of our indifference to the encouragement of scientific application in our industries, may now be regarded as having been atoned for by the wonderful achievements and progress of the past eight or nine years. We have started, and we have gone a long way towards the achievement of a coal tar industry on a national scale—a scale so large as to demand before long an increase in the quantity of coal we carbonise. The chemist at least has played his part well. Was it not Alexander Findlay who said that the researches into and applications of coal tar products are triumphs of the human intellect such as to command the admiration and wonder of all thinking men? The chemist has entered into competition with Nature herself and has broken the monopoly which hitherto she enjoyed in giving us so many indispensable compounds.

Sulphate of Ammonia Progress

THE work of the British Sulphate of Ammonia Federation, very thoroughly reviewed by Mr. D. Milne Watson, the chairman, at the annual meeting last week, makes a record of a very significant character. Even more interesting than the figures contained in the fourth annual report is the reference to Synthetic Ammonia and Nitrates, Ltd., who are members of the Federation, and who are heartily congratulated on bringing into large-scale production their nitrogen fixation plant at Billingham, and in maintaining an uninterrupted output from the start. This is rightly described as "an achievement of first-rate importance in the history of British chemical enterprise." It is of great interest to hear that the Billingham company, controlled by Brunner, Mond and Co., are already the "largest individual producers in the country," and that the plant is capable of extension to meet the growing demand for sulphate of ammonia. These results, so briefly and almost casually reported, are much more even than a great testimony to the scientific and commercial resources of the Brunner-Mond organisation. They are a credit to British chemistry and to the British nation.

There is another interesting point which presents a problem of importance and possibly also of some difficulty to the technical staff in charge of sulphate production processes. Well over 80 per cent., as is already known, of the total output is now neutral. Considerable improvement has been effected in the mechanical means of eliminating the free acid and rendering the final product friable and free from lumps. The advent of considerable quantities of the German synthetic product on the export markets

has provoked comparisons with the British neutral salt. It is clear, the report states, that buyers have a preference for neutral sulphate of ammonia, which contains distinct crystals, and these should be as large as the plant can produce. Not only will this condition prevent any tendency to cake; it will also avoid the danger, a considerable one in the case of a dry, powdery salt, of a good proportion being blown away in the process of distribution, and the allied danger of being too readily washed through the soil. The Council's conclusion, therefore, is that "all neutralising plant which has the effect of reducing the final product to a powdery form should be immediately replaced by one of the more modern plants which preserve the natural crystals in the salt." Of the advantages of the crystal as compared with the powder form, we imagine there can be no difference of opinion; the only point for the technical man is that the production of a crystal may be more difficult than the production of a salt. It is, however, his business to get over such difficulties, and he rarely fails when the necessity calls for success.

This same remark applies to general costs of production. While these have remained much the same as during the previous year, there has been a small reduction in acid prices, which have ranged from 50s. to 70s. per ton, according to district. These prices, however, are confidently held to be still considerably over the price at which acid could be produced without loss by newly-installed plant, notwithstanding high cost of erection and installation.

Returning to more general aspects, the outstanding feature of the year has been an increase of nearly 8 per cent. in the world's production of sulphate of ammonia, bringing the total output up to about 2,473,000 tons, and thus securing for sulphate of ammonia "the premier position among nitrogenous fertilisers, so long held by nitrate of soda." This 8 per cent. increase in consumption has been secured at the cost of a reduction of 10 per cent. in the price, and covers a period during which the price of nitrate of soda has been firmly maintained, if not actually increased, by the simple expedient of reducing production. There is here, as the report points out, a radical difference between the two products. Chile sodium nitrate represents a limited natural deposit, and is therefore a wasting asset, even though the caliche may last for a few hundred years or more. The output of ammonium sulphate, on the other hand, is capable of almost unlimited expansion as the world needs gradually increase.

Taking the figures for home production and distribution for the past ten years, we find that the total production in 1913 was 372,000 tons, as compared with 401,400 tons in 1923. As regards home agricultural consumption, the figures have no doubt suffered from recent agricultural depression, for while in 1919–20 we consumed at home 233,500 tons, the figure for 1923–24 is 142,400 tons. Turning to exports, the net increase for the year amounts to 70,000 tons following on last year's increase of the same figure. Japan accounts for the bulk of this increase. The figures for Spain show a slight falling off, but this was due to shortage of supply and not to lack of demand. The Canary Islands, Italy, China, and the Colonies all show small, but satisfactory, increases, and new markets are steadily being opened up. The table of exports shows that the figure for 1923–24 of 259,682 tons is the largest since 1915–16, when it stood at 264,992 tons.

In the matter of general average prices, home and export, there has been a marked incline in recent years. The highest average for neutral sulphate was in 1919–20, when it stood at £23 15s. 3d. The figure for 1923–24 is £13 5s. 11d. The yield to the Federation on quantities sold for home use was 5s. 8d per ton less than for export.

The figures quoted give some idea of the very large scale on which the operations of the Federation are now conducted, and the chairman (Mr. Milne Watson), the executive committee, the general manager (Mr. Speyer), and the staff are to be congratulated on the vigour and excellence of the organisation they have created.

Nine Years of Dyestuffs Manufacture

THE passage of time in the past few eventful years has had the appearance of being so rapid that it is difficult to realise that it is now just about nine years since this country and America were first awakened to the necessity for developing complete and self-supporting industries for the provision of dyestuffs. The two countries set out from very much the same starting points, and it is not surprising, therefore, that their methods of attack, as well as their problems and frequent disappointments, have all through been very similar. Our memories, particularly so far as the tribulations and devotion to duty of others are concerned, are as a rule all too short, and it is accordingly no bad thing that we should be reminded from time to time of the almost insurmountable obstacles which at intervals seemed to stand in the way of what can now be described as one of the most remarkable industrial accomplishments of recent years.

The progress which has rewarded the American workers has been admirably traced out lately by Dr. Charles H. Herty, who does not hesitate to say that when America called for economic independence from the conditions which faced her after the first year of the war there were those who openly expressed their conviction that the task was an impossible one. What is the position to-day? That the vision of 1915 has almost become a reality is shown by the fact that at the present time fully 96 per cent. of American consumption is being supplied by the home industry, while some 18 million lb. of American dyes is annually being exported, the capital employed running into about 100 million dollars. It is interesting to note that in the early days a motley crowd of manufacturers, attracted by the huge demand for products regardless of quality, rushed into the field; but the unqualified quickly fell by the way, so that the number of manufacturers engaged in the work has now become pretty nearly constant. There were those, of course, who predicted that the industry would soon become consolidated into a few large units, or even into one great unit in imitation of the German organisation; but things have worked out on much the same lines as they have over here, namely, a survival of a group

of both large and small undertakings varying from those working on a few specialities to those producing an infinite variety of substances.

As to the immediate past, the most striking developments have been the constant improvements effected in quality. It would be idle to gainsay the fact that in the early days the materials, both here and in America, were frequently faulty; there was a lack of uniformity both as regards strength and quality, but the experience gained from these mistakes has been invaluable. In both countries, too, the industry affords a study in the use of protective systems, and the progressive decline in the cost of the products manufactured demonstrates that the welfare of consumers is adequately safeguarded by domestic competition. It is well to note, however, that in America at the present time a little uncertainty prevails owing to the automatic lowering of the special tariff which took effect just two months ago. The industry seems far too solidly established for its continued expansion to suffer, but it regards the revision of the tariff as an undeserved jar and probably an uneconomic one.

Merchants and Reparation Colours

It is announced by the British Chemical and Dyestuff Traders Association that the Board of Trade have agreed to allow merchants who purchase reparation colours for re-sale a special merchanting discount. For purchases over a period of three months totalling £1,000 to £1,250, the discount allowed will be 2½ per cent.; for purchases of £1,250 to £1,750, 3 per cent.; for purchases of £1,750 to £2,250, 4 per cent.; and for purchases of £2,250 and upwards, 5 per cent. The scheme will operate from December 1. This discount, we understand, will not be given to consumers, and it may be presumed that the object of the Board of Trade in making such concessions is to facilitate the sale of the existing reparation stocks of colours. Although the concession is not exactly revolutionary, it is a notable decision on the part of a Government Department which has sometimes been suspected of not being too eager to give official recognition to the merchant class. It is also a reminder to merchants themselves that the only method of exacting recognition is the familiar one of collective action.

Wembley in 1925

The decision to continue the British Empire Exhibition through another summer at Wembley was officially confirmed this week by the executive committee. The Duke of Devonshire, who now joins the Board of Directors, has already expressed the opinion that it is not desirable that the Wembley of 1925 should look exactly like that of the present year. The intention is that it should be a great Imperial undertaking but not the same show as before. The main architectural features, since these are of a permanent character, must necessarily remain, but beyond this there is plenty of scope for variation. One of the important questions to be settled is the opening date. Many interested in the matter favour a date about the middle of May, and the sooner this is fixed the better prepared prospective exhibitors will be for making their arrangements.

Although the arrangements for a chemical exhibit will almost certainly depart in detail from those of the present year we believe there will be general agreement on the need of British industrial chemistry being prominently represented again. In this matter, it may be possible, by eliminating the individual element, to emphasise more the collective aspects of the industry. The gas industry set a good model in this respect this year, and something on the same broad lines would be comparatively easy in connection with the chemical industry. It is early yet to think about details, but one may rest assured that there will be no unnecessary delay with the arrangements, and that the chemical exhibit, whatever new form it may take, will be creditable both to the industry and to the organisers.

Points from Our News Pages

The great possibilities of coal tar constituents are reviewed in an article on page 542.

Recent developments in the application of coal tar products are outlined and novel uses are cited (p. 545).

The annual meeting of the British Sulphate of Ammonia Federation is fully reported (p. 548).

Letters are printed on "Luton Chemical Works Strike" (B. Laporte, Ltd.); "The Lyons Fair" (T. J. Craddock Jones); "Tests of Water Gas Plant" (A. Parker) (p. 550).

A report of the presentation to Professor Smithells and a reproduction of the portrait appear on page 552.

Little activity is reported in the Scottish market (p. 565), but our London report shows brighter conditions and an optimistic outlook prevails (p. 562).

The Calendar

Dec.		
1	Royal Institution of Great Britain: General Monthly Meeting. 5 p.m.	21, Albemarle Street, London, W.1.
1	Institution of the Rubber Industry (London Section): "Research Work on the Plantation." Major B. J. Eaton.	Engineers' Club, Coventry Street, London.
1	Royal Society of Arts—Cantor Lecture (II): "Modern Colour Problems." Dr. Louis C. Martin. 8 p.m.	John Street, Adelphi, London.
1	Oil and Colour Chemists' Association. Joint Discussion with the Society of Chemical Industry (London Section): "Protective Paints."	Burlington House, Piccadilly.
1	University of Birmingham Chemical Society: "The Bohr Theory of Atomic Structure." R. E. Kellett.	Edgbaston.
2	West Yorkshire Metallurgical Society: "The Corrosion of Engineering Materials." 7.30 p.m.	George Hotel, Huddersfield.
2	Institution of Petroleum Technologists: General Meeting. 5.30 p.m.	John Street, Adelphi, London.
2	Institute of Metals (Birmingham Section): "Metal Spraying." W. E. Ballard. 7 p.m.	Chamber of Commerce, New Street, Birmingham.
2	Institute of Metals (N.E. Coast Section): "Aluminium, its Production and Uses." G. B. Brook. 7.30 p.m.	Armstrong College, Newcastle-on-Tyne.
3	Institute of Chemistry (Leeds Area Section): Annual Meeting. 7 p.m.	Great Northern Hotel, Leeds.
3	Society of Public Analysts: Papers by G. van B. Gilmour, A. H. Ware, S. Glasstone, B. S. Evans. 8 p.m.	Burlington House, Piccadilly, London.
3	Leicester Literary and Philosophical Society, Chemistry Section: "The Action of Light on the Photographic Plate." Dr. T. Slater Price. 8 p.m.	The Museum, New Walk, Leicester.
3	Society of Chemistry Industry (Nottingham Section): Paper on "Glass" by Professor W. E. S. Turner. 7.30 p.m.	University College, Nottingham.

Pure Coal-Tar Constituents and their Possibilities

Of the two or three hundred constituents of coal tar only a few come on to the market in approximately pure condition. The writer points out that there is an increasing tendency to extend the list, that processes for manufacture exist for the purpose, and that preparation on a commercial scale will follow when the necessary demand arises.

Of the pure coal-tar products, benzene, toluene, naphthalene, and phenol have been sold for many years now, but processes have been devised and patented for a number of others, and their application on the manufacturing scale only awaits the necessary demand. These processes, having been worked out in the laboratory mostly, will no doubt require some alteration and improvement, but this can always be achieved under sufficient stimulus, as was proved in many instances during the war. The difficulty is not usually a technical but a commercial one—that is, the finding of sufficiently large outlets for the products at profitable prices. This has at times been true as regards naphthalene, which exists in comparatively large quantities in tar and is easily and cheaply separated. Its application in the dyestuff industry has never been great enough to absorb the whole production and new uses are desirable. As regards phenol the opposite is the case. At times the demand for phenol, even apart from special war requirements, has risen to such an extent that its production synthetically from benzene by sulphonation and alkali fusion has become necessary.

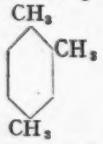
It will be of interest to review the processes proposed for the isolation of some of the less common constituents of coal-tar. The general lines of the separation of the constituents, by a preliminary fractional distillation into light, middle, heavy and anthracene oils and pitch, have long ago been worked out, and recent progress in this stage has been chiefly in the direction of economy in operation. This applies to the continuous distillation processes which are being increasingly used. The tar is fed in at one end of a system of stills maintained respectively at the temperatures required for the different fractions, the pitch being run off at the other end of the system. In such processes great economies of heat and power are possible by the use of the heat exchange idea, so that, for example, the outflowing pitch is made to heat the incoming tar.

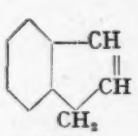
Separation of Individual Products

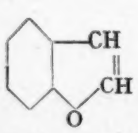
Further treatment of the main fractions is still along the lines of obtaining crude mixtures for various industrial purposes—crude benzols as solvents and as fuel for internal combustion engines, solvent naphtha, pyridine bases for the denaturing of alcohol, cresols as disinfectants, the higher boiling oils as fuels and wood preservatives, and the highest fraction, after extraction of the anthracene, for mixing with the pitch to make the prepared tars for roads. But the tendency is always growing to separate the pure individual substances, a tendency which has resulted, as stated above, in the devising of processes for such separations even in advance of any outlet or a sufficient outlet for the substances themselves.

Pure benzene and toluene, which were formerly separated from the crude fractions by their chief users, the dyestuff manufacturers, are now made by the tar distillers themselves. The same applies to phenol and naphthalene. Methods have been devised for the separation of the three xylenes from one another, though they are apparently not largely in use. One method depends on the fact that 80 per cent. sulphuric acid sulphonates meta xylene under conditions which leave the ortho and para compounds unattacked. The metaxylene sulphonic acid is then easily separated and can be hydrolysed by hot diluted sulphuric acid in order to regain the meta xylene. The difference between the boiling points of the ortho (144° C.) and the para (136° C.) compounds is such that they can be separated by systematic fractional distillation, combined with fractional crystallisation, since para xylene freezes at 15° C., while the freezing point of the ortho compound is −45° C.

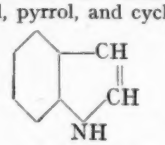
The higher boiling fraction of solvent naphtha contains three substances—pseudocumene, indene and coumarone,

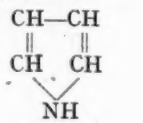

Pseudocumene.

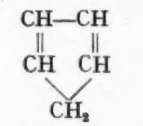

Indene.


Coumarone.

whose isolation has attracted some attention. Pseudocumene can be separated from the fraction boiling at 165-175° C. by sulphonation. The pseudocumene sulphonic acid formed differs from those of the other hydrocarbons present in being almost insoluble in the sulphuric acid used for the sulphonation, so that it is easily separated, the pseudocumene being recovered by the usual hydrolysis of the sulphonic acid. Indene and coumarone, however, are not so easily obtained. They polymerise to resins when the oils containing them are shaken with concentrated sulphuric acid, a property which seems to be due to the group—CH=CH—in the five-membered rings of their molecules, since other similarly constituted bodies show the same inclination to polymerise—for instance, indol, pyrrol, and cyclopentadiene :—


Indol.


Pyrrol.


Cyclopentadiene.

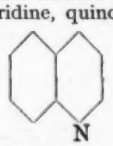
The resins so formed remain dissolved in the solvent naphtha and are obtained on distilling off the volatile hydrocarbons. As synthetic resins they have attained considerable industrial importance. But coumarone and indene themselves can be obtained from their respective fractions (165-175° C. and 175-185° C.) by addition of picric acid, which precipitates the picrates of the two substances. The method, however, does not give a good separation of coumarone and indene, and in the case of indene another method has recently been proposed for its isolation. This method takes advantage of the acidic nature of the—CH_2—group in the five-membered ring, which enables a potassium derivative to be formed. The 175-185° C. fraction, after extracting the phenols by washing with dilute alkali, and the bases by dilute acid, is heated with caustic potash at 170-180° C. for a few hours in a closed vessel. The indene potassium compound is separated from the residual oil and on addition of water decomposes to form indene again, which is then filtered off and distilled for purification.

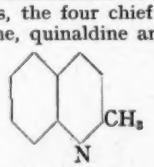
In the so-called middle oil, the phenols and naphthalene become the important constituents. Phenol itself, which has long been isolated in the pure state from this fraction, need not concern us here. But as regards the three cresols, though they are still mostly used in the crude mixture " cresylic acid " for disinfectant purposes, increasing attention has been paid of recent years to the problem of their separation. Ortho-cresol, boiling at 191° C., is easily separated by fractional distillation, using an efficient column, from the meta (b.p. 203° C.) and para (b.p. 202° C.) compounds. But for the separation of the two latter substances chemical methods are necessary. Several schemes have been proposed, of which probably the most satisfactory is that involving the sulphonation of the mixture. From the mixture of monosulphonic acids the less soluble sulphonic acid of para-cresol crystallises out first and an almost complete separation of the two substances can be obtained in this way. The separate sulphonic acids are then hydrolysed by superheated steam and the cresols further purified by recrystallisation.

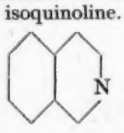
Basic Constituents

Coming now to the basic constituents of tar, found mostly in the light and middle oils, the four chief members of this series are pyridine, quinoline, quinaldine and isoquinoline.

Pyridine.


Quinoline.


Quinaldine.

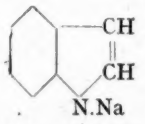

Isoquinoline.

As no great use has been found for pure pyridine, apart from laboratory purposes, no large scale attempts have been made to separate it from its accompanying homologues, the picolines, lutidines and collidines, this mixture of so-called light tar

bases serving as well for any industrial purpose as pure pyridine. Again, the isolation of quinoline and quinaldine from the higher boiling tar bases cannot compete with the syntheses of these substances by the Skraup and Doebner-Miller methods from aniline. No such convenient synthesis has, however, been devised for isoquinoline, and in consequence its isolation from the tar bases becomes important. The boiling points of quinoline (238° C.) and isoquinoline (240° C.) lie too close together for separation by fractional distillation, but in the following ingenious process advantage is taken of the fact that isoquinoline is more basic than quinoline. A quantity of the crude quinoline bases extracted from the 220-260° C. fraction of the heavy oil is dissolved in benzene and the solution shaken with so much 20 per cent. sulphuric acid as will unite with a sixth of the quinoline mixture. The acid takes up the isoquinoline by preference, though not exclusively, and this effects the main separation. The aqueous solution of the sulphates, consisting chiefly of isoquinoline sulphate, is separated, the bases set free by alkali, and fractionally distilled. A final purification is effected by reconverting to the sulphates and submitting these to fractional crystallisation, the isoquinoline sulphate being the less soluble of the two.

Another coal-tar base which may become important in the future is acridine, whose high boiling-point (over 360° C.) places it in the anthracene oil fraction. As convenient synthetic methods for its preparation are lacking at present, its isolation from coal-tar may become important. It can be extracted from anthracene oil by agitation with dilute sulphuric acid. On adding potassium bichromate to the aqueous acid extract acridine bichromate is precipitated and may be filtered off, the base being then set free by ammonia. But the excessively irritant action of acridine on the skin would make the isolation a most unpleasant operation.

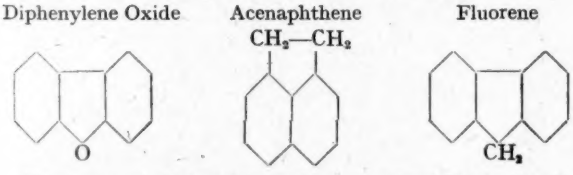
Returning now to the hydrocarbons and other neutral bodies of coal-tar, there are found in the heavy oil in substantial quantities several interesting bodies for which methods of separation have been worked out, though as yet no sufficiently widepread uses have been found for them. Indole (which, by the way, is not basic in properties) forms 3-5 per cent. of the 220–260° C. fraction of coal-tar. After freeing the oil from phenols and bases in the usual way, the residual oil, when heated with sodium or sodamide, forms a sodium substitution product of indole :—



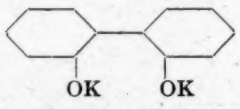
This separates out from the oil as a solid which on treatment with water yields indole. It is, or was, sold by the Badische Aniline Co. and other German firms for use in perfumery, and though not much is used the price obtained for it must have made its extraction profitable. Before the war the price of the pure substance was ten shillings a gram.

In the 260-300° C. fraction of heavy oil there are in fair quantity three substances whose isolation on a manufacturing scale has been accomplished. These are :—

Diphenylene Oxide Acenaphthene Fluorene



Fluorene and diphenylene oxide are extracted together by heating the oil to a high temperature with caustic potash. In the case of fluorene potassium enters the meso-CH_2 group, which is acidic in nature, while diphenylene oxide is hydrolysed to the potassium salt of diphenol :—

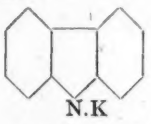


Both of these compounds are insoluble in the residual oil, from which they are separated. On treatment with water, the fluorene potassium compound is decomposed, the fluorene being reformed, while the potassium diphenol simply dissolves. The fluorene is filtered off, and on adding acid to the filtrate, diphenol is precipitated, and can either be used as such or converted back to diphenylene oxide by heating with a dehydrating agent. The fluorene obtained by this method is contaminated with phenanthrene which is rather difficult to get rid of. No wide uses have been found for fluorene and diphenylene oxide, but they can be obtained by some such method as the above in large quantities if required.

On the other hand, acenaphthene yields a few useful dyestuffs, and its isolation is a matter of greater present importance. Chemical methods of separation are not available in this case, and an elaborate process of fractional distillation and crystallisation is used.

The Discovery of Hydron Blue

The highest boiling fraction of the coal-tar distillate anthracene oil contains besides the acridine already mentioned anthracene, carbazole, and phenanthrene, on the separation of which a great deal of work has been done. The object of this work was formerly the isolation of anthracene alone, but the discovery of Hydron Blue, avaluable dyestuff derived from carbazole, has directed attention to the separation of this latter substance also in the pure state. Phenanthrene, although the most abundant of the three substances, and, indeed, next to naphthalene, the most abundant constituent of coal-tar, has found no uses up to the present. When the fraction of coal-tar distilling roughly between 300 and 400° C. is cooled and allowed to stand several days, a quantity of solid separates which, after filtering and centrifuging, contains 30–40 per cent. of anthracene, the remainder being chiefly carbazole and phenanthrene. An approximate separation of these three sustances is carried out by taking advantage of their varied solubilities in different solvents, of which the most useful have proved to be the light pyridine bases and solvent naphtha. Of the three substances only phenanthrene is soluble in solvent naphtha to a fair degree, so that treatment with this solvent removes most of the phenanthrene. The residual mixture is then extracted with pyridine in which most of the carbazole dissolves, leaving a crude anthracene of about 80 per cent. content in anthracene, which is considered pure enough for the oxidation process to anthraquinone. The crude carbazole recovered from the pyridine extract is purified by heating with caustic potash in some indifferent solvent at a high temperature, which converts the carbazole to its potassium derivative :—



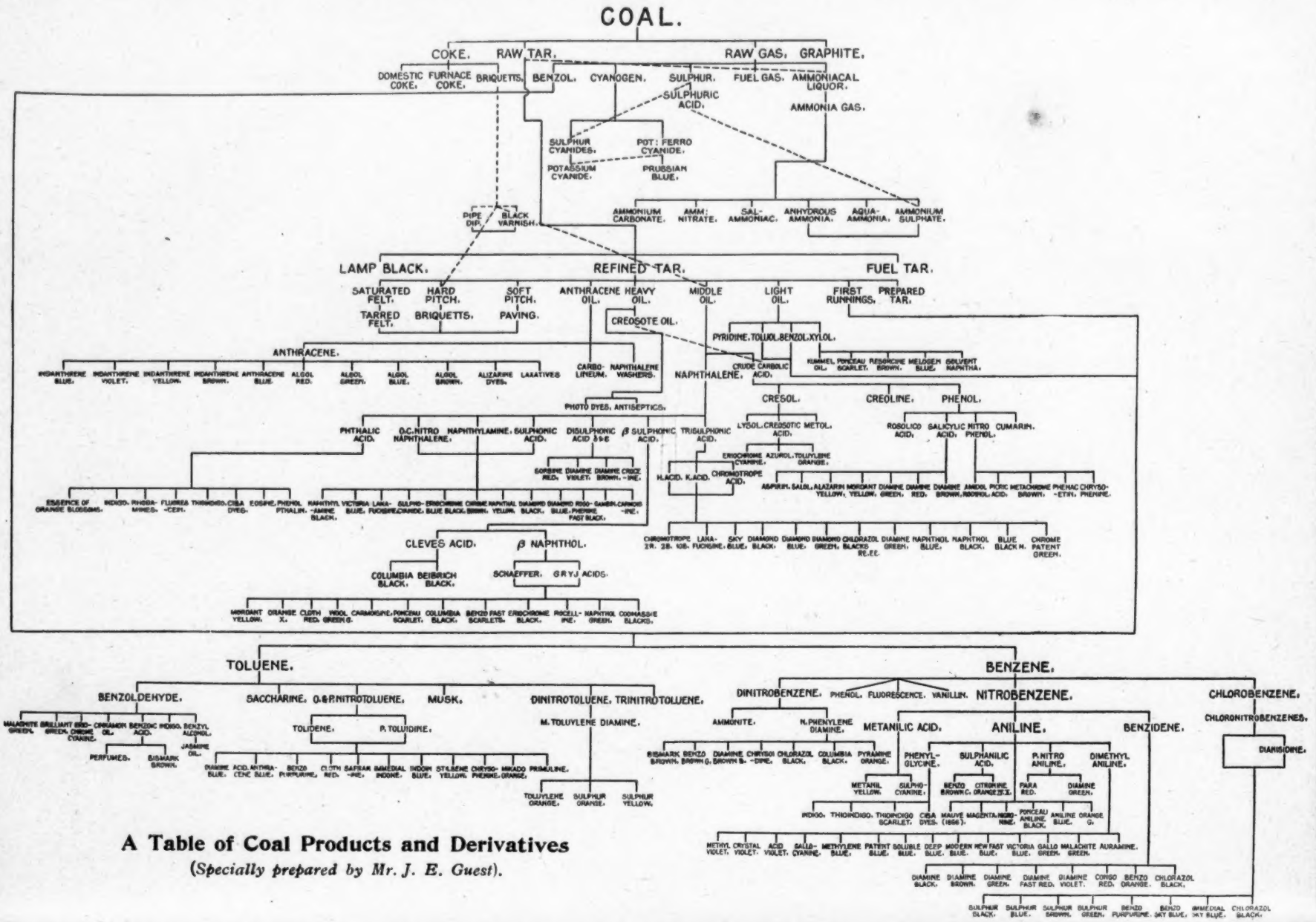
a solid which can be separated and on boiling with water yields carbazole. Further purification, however, is necessary if the carbazole is to be used for Hydron Blue. Not so much attention has been paid to the purification of phenanthrene, since, as stated above, no substantial uses have been found for it.

The foregoing review will serve to indicate that, as a source of pure chemicals of great potential uses, coal-tar is still largely unworked. Phenanthrene, fluorene, indole, diphenylene oxide and many other substances can all be produced in as large amounts as benzene or anthracene, and probably, on the average, as cheaply if the production is on a sufficiently large scale. The only thing lacking is the demand for these products. It remains to be discovered what they are useful for, but no doubt the discovery will not be long delayed.

Aberdeen Chemical Club

THE officers just elected for the current session of the Aberdeen Chemical Club are :—Hon. President, Mr. W. Thomas ; Hon. Members of Committee, Messrs. W. Godden and C. McLeod ; Hon. Secretary and Treasurer, Mr. R. Craven.

Meetings are held in the Chemistry Department, Marischal College, Aberdeen. The aim of the Club is to afford those interested in chemistry an opportunity to meet together to discuss matters of chemical interest, and membership is open to all interested in chemistry, but the members are mostly of graduate standing.



A Table of Coal Products and Derivatives

(Specially prepared by Mr. J. E. Guest).

Coal Tar Products

Recent Developments in their Application

An amazing number of industries, by no means all of them chemical, are now dependent in some degree on coal tar products. The ramifications of these products are, in fact, so great as to make it almost impossible to trace them to the end of their careers. Below will be found a review of the more recent developments which have occurred and of some of the novel applications to which these products may now be turned.

If we take stock of the raw materials in which the products of the organic chemical industry have their origin we shall find that coal tar easily takes the first place. Included in coal tar is coke-oven tar, the two products being almost identical. At one time coal tar was a waste product, in fact, a nuisance. In course of time it became a serviceable by-product. To-day, although still a by-product in a technical sense, it is one of the most valued of all our raw materials and an important source of income to the undertakings producing it. The chart, on page 546, which is necessarily very incomplete, will give some idea of its many uses. The coal tar using industries now form the major part of our organic chemical industry, and the industries are many which use these products and which cannot be termed chemical at all. They defy classification and are constantly on the increase. It must be borne in mind that some of the products for which coal tar is the main source can be, and sometimes are, obtained in other ways. The improvements in the methods of their isolation and purification have gone hand in hand with the increasing demand for them. It may be safely asserted that even greater and more extended use will be found for them in the future, and that uses will be found for many of the coal tar constituents which have so far found no industrial application.

The history of the development of the dependent coal tar industries forms one of the most fascinating stories of scientific and commercial enterprise, and is an outstanding tribute to the skill and resource of the chemist. It forms a final and emphatic answer to the question of the value of research, and constitutes one of the greatest industrial and financial justifications for research that can be found. The part played by these industries in our economic and industrial life, and their contribution to our national prosperity, need no elaboration here.

No attempt can be made in a short review to give an account of the development of these industries, but it will not be without interest to give a brief sketch of a few of the more recent applications of the derived coal tar products. These may be roughly divided into those developments which have taken place in industries already well established, and those which have given rise to what are, to all intents and purposes, new industries. To the former belong dyestuffs, drugs and antiseptics, explosives, perfumery, photography, disinfectants and preservatives, fuels, etc. Among the latter may be mentioned the artificial resins and plastics, synthetic tanning materials (vegetable tanning substitutes) and the hydrogenated naphthalenes and phenols.

Artificial Resins

One of the most important and interesting of the developments in recent years is the commercial production of resins from coal tar products. There are at the present time an enormous number and variety of these substances. One of the most important commercially is the so-called Coumaron resin, which is a polymerised product of coumaron and indene and their homologues. It is made from solvent naphtha by the action of sulphuric acid. It has been put to a variety of uses, the paint and varnish trades being the chief consumers. It forms a constituent of many varnishes, lacquers, coatings, etc., and is employed in the production of certain rubber compounds. The phenol-formaldehyde resins belong to a somewhat different type, and although preliminary work was done by the earlier investigators many years ago, the commercial developments, largely due to Baekeland in America, are comparatively recent. The production now runs into millions of lbs. annually, and is almost entirely in the hands of the Bakelite Corporation. There is an almost endless variety of resins prepared from phenol, the cresols, etc., by condensation with formaldehyde and other aldehydes. The variety of products is largely a consequence of the variety of purposes for which these resins are required. They find their way into an extraordinary number of commercial articles and their applications are being extended almost daily. Thus their usefulness ranges from electrical insulators to varnishes, from lacquers and enamels to artificial amber. The use of other coal tar products such as toluene, xylene, and naphthalene is also involved in some of the applications of these resins.

Tanning Materials

It is somewhat curious that the condensation of phenols and formaldehyde—surely one of the most important reactions discovered (in a commercial sense) during the last twenty or thirty years—leads to another class of products whose application is quite different and distinct from that of the resinous products mentioned above. In 1911 the Badische Co. marketed a tanning substitute under the name of Neradol. It was obtained from phenol and formaldehyde. It proved a practical success and its manufacture was undertaken in this country during the war. Since that time the production of synthetic tannins has developed considerably. Great activity is being shown in the production of new tanning materials, novel processes and products being constantly brought out by an increasing number of firms. Not only phenol, but a number of other coal tar derivatives are employed, e.g., cresols, naphthalene, carbazole, naphthylamine, anthracene, phenanthrene, and so on. These are mostly employed in the crude state such as creosote oil, anthracene oil, naphthol pitch, etc. Some of them are applied direct as sulphonic acids, and with others condensation products are obtained without the use of formaldehyde. Sulphonated coumaron resins are also used. The commercial success of these products has added another branch to the organic chemical industry and a new set of problems to the leather industry.

Hydroaromatics

Another interesting development of recent years is the manufacture of the hydrogenated naphthalenes and phenols. They are now being produced commercially on a large scale and indeed a company for their manufacture—the Tetralin-gesellschaft—has been formed and is well established in Germany. It is somewhat remarkable what a range of uses has been found for these products, a range which is daily becoming more comprehensive. The hydrogenation of naphthalene yelds the tetrahydro- and decahydro-derivatives. These are the now well-known "Tetralin" and "Dekalin." They are powerful organic solvents and have properties particularly desirable in industries which have to deal with fatty oils, waxes, and gums, especially the oil, paint and varnish industry. They have a high flash-point, evaporate slowly and completely and are non-toxic. Tetrahydronaphthol—"Tetralol"—is employed as a disinfectant, especially in soaps. Hexahydrophenol—cyclohexanol—has also found a large number of important uses. It is marketed under the names of "Hexalin" and "Adronal." It is an excellent solvent for many techincal products such as fats, oils, waxes, resins, rubber, celluloid, mineral oils, etc. The cresols yield similar reduction products.

One of the most important properties of these hydrogenated phenols is that of dissolving in aqueous soap solutions. The resulting colloidal solutions have very powerful detergent and emulsifying properties. These new soaps have appeared on the market under the names of "Texalin," "Hydralin," "Savonade," etc. They find valuable application as defatting and degreasing agents in the textile trades, but can equally well be employed for all ordinary purposes such as in the laundry and house. They are also used as constituents in such preparations as pastes, polishes and creams for furniture,

Coal Tar

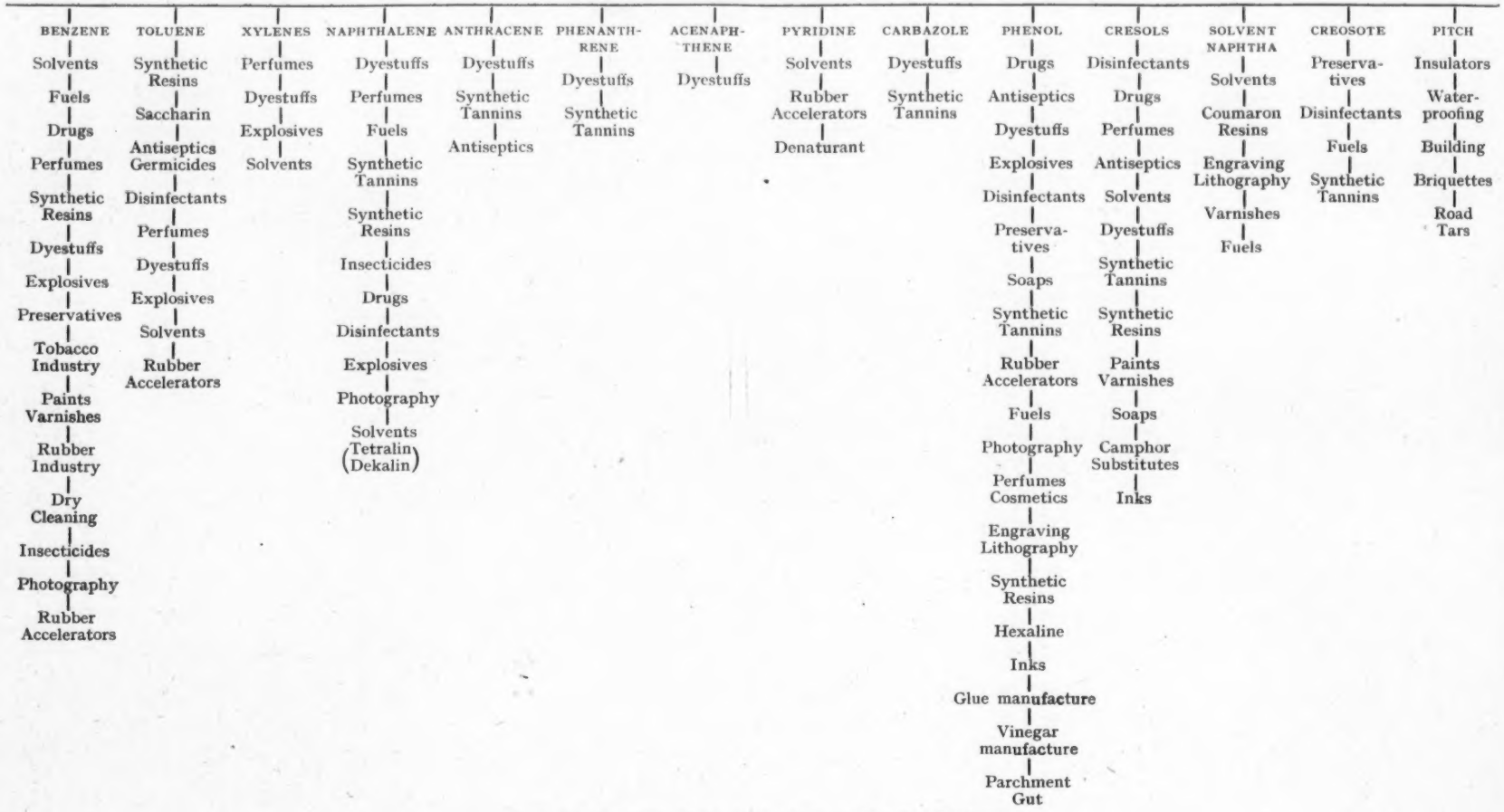


Chart showing some of the applications of Coal Tar Products.

metals and leather; in varnishes and lacquers, especially those derived from nitrocellulose. Hydrogenation of crude phenol yields a product which can be used as a camphor substitute in celluloid manufacture. A number of substituted *ar*-tetrahydronaphthols have been made for which considerable disinfectant and germicidal powers are claimed. There can be no question that these products, like the artificial resins, have come to stay.

Drugs and Antiseptics

Among the older industries employing coal tar products the past few years have witnessed a steady increase in the evolution of new products and an ever broadening field of their industrial application. One of the most interesting is the production of new drugs and antiseptics. As the result of intensive research, advances of a far-reaching character have been made whose interest is, perhaps, more scientific than commercial. For example, there is the application of dyestuffs as antiseptics. A number of dyestuffs have been found to be powerful lethal agents for bacteria and protozoa. The most active antiseptics have been found to be the basic dyestuffs of the triphenylmethane and acridine groups. The oxazine colour, Meldola's Blue, has been successfully applied for the removal of bulking in sewage tanks during the aeration process. The preparation of Trypan Red, Trypan Blue, and Afridol Violet and their application are now well known. They are complex dyestuffs of the azo class and were found to have valuable trypanocidal properties. A pursuance of the work on this class of compound has led to the production of Bayer 205 around which so much interest has now centred. It is extraordinarily efficacious in the treatment of trypanosomiasis and has cured a number of cases of African sleeping sickness. The production of organic arsenic compounds still attracts a goodly share of attention. One of these, Tryparsamide, has proved effective in cases of sleeping sickness. Some new gold compounds such as the aurophenols and aurothiophenols—compounds containing the OAu and SAu groups—have been successfully applied in medicine, especially for tuberculosis. The acridine derivatives Acriflavine, Proflavine, and Rivanol still find extensive application in surgery and as general antiseptics. Mention should also be made of the chloroamines such as Chloramine T, Dichloramine T, and Halazone. The drugs and antiseptics of one kind and another which have been put on the market in recent years are too numerous even to indicate. They are practically all derived more or less directly from benzene, phenol and naphthalene. Even anthracene (*e.g.*, 1 : 8-dihydroxyanthranol, Cignolin) has now entered the lists.

Dyestuffs

From the coal tar point of view there have been few developments of a startling character in the dyestuffs industry in recent years. With few exceptions progress has been along lines already more or less established. One or two points are, however, worthy of special mention. The utilisation of carbazole is comparatively recent. It gives rise to the important sulphur colours of the Hydron Blue class. Another recent innovation is the production of dyestuffs from perylene and perylenequinone. Perylene is obtained from dihydroxydinaphthyl. Greater calls than ever are being made on the supply of anthracene due to the increasing number and output of the anthraquinone vat dyes. Reference must also be made to the importance attained in recent years by Naphthol AS (β-hydroxynaphthanilide). It is employed in the production of developed colours on cotton. Another development of importance is the production of the photosensitising dyes. They are mainly derivatives of quinoline and its homologues. Before the war Germany had the monopoly of these products, but they are now being manufactured in this country. The same may also be said of the photographic developers (metol, amidol, etc.). Although not manufactured in large quantities the special photographic dyestuffs are nevertheless very important. Among the better known may be mentioned Pinacyanol (Sensitol Red), Pinaverdol (Sensitol Green), Pinachrome Blue and Pinachrome Violet. The monoalkyl ethers of 1 : 4-dihydroxynaphthalene have found application as developers as have the halogenated quinols. Nitrobenzene has been employed in sulphide toning.

Rubber Accelerators

Activity in the production of organic accelerators for the rubber vulcanisation process continues practically undiminished. Fresh claims on behalf of new compounds are continually being advanced. The use of these compounds dates from about 1912 and forms an interesting example of a new field of usefulness for many coal tar products. The list of substances is now a very long one. Their activities vary according to circumstances—*e.g.*, the presence of compounding ingredients. The desirable qualities in any accelerator are: convenient critical temperature (*i.e.*, temperature at which activity commences), which must neither be too high nor too low; no discolouring effect on the product; non-toxicity, and cheapness. Naturally these considerations narrow the field considerably. Among those derived from coal tar products may be mentioned thiocarbanilide, formanilide, the phenylguanidines, *p*-nitrosodimethylaniline, *p*-nitrosophenol, methyleneaniline, benzalaniline, piperidine, aniline, and quinoline.

Perfumery

Like many other industries the perfumery industry had at one time to rely solely on nature for its raw materials. It still does to a great extent, but for a long time now synthetic products have been creeping in. Many of these are derived from coal tar, and they are now extensively used for a variety of materials used in perfumes and flavourings. In fact, some of the newer perfumes consist entirely of synthetic products. Among the most important of these compounds which are derived from coal tar are the esters of salicylic acid, benzoic and cinnamic acids, esters of benzyl alcohol, phenylethyl alcohol, cinnamic and hydrocinnamic aldehydes, coumarin and methylcoumarin, cresol methyl ether, and the methyl and ethyl ethers of β-naphthol. Artificial musk is trinitro-isobutyl-*m*-xylene and is prepared from *m*-xylene. Mention may also be made of the use of indole in giving " body " to many perfumes. Two very important starting materials are vanillin and thymol. Many attempts have recently been made to produce these synthetically. Thus vanillin may be obtained in the following way. Guaiacol and *p*-nitrosodimethylaniline are condensed with formaldehyde. Hydrolysis of the product yields vanillin and dimethyl-*p*-phenylenediamine. Several patents have recently been taken out for the preparation of thymol. One of these uses *m*-cresol as starting point and in another *p*-cymene is the raw material. It is a safe prophecy that the coal tar derivatives will find increasing application in this flourishing branch of the organic chemical industry.

Miscellaneous Applications

Only a passing reference will be made to the explosives industry. Most of us are familiar with the almost revolutionary developments brought about by the war. If ever coal tar was a precious national asset it was during the war years. The production of the nitrotoluenes, picric acid, nitroxylenes, nitronaphthalenes, hexanitrodiphenylamine, and tetryl is now common knowledge as is also the production of synthetic phenol.

A reference must be made to the employment of the coal tar products as fuels. The use of benzol as motor fuel needs no comment, neither does that of naphthalene in firelighters. It has also found a use as fuel, in the molten condition, for internal combustion engines. Phenols and cresols and their hydrogenation products, the hydronaphthalenes and naphthols, hydroanthracene, etc., have all been used as constituents of motor spirit. Tar oils were employed extensively during the war as fuel for our navy and in Diesel engines, and proved satisfactory.

Among the host of applications of benzene, toluene, xylenes, pyridine and other coal tar products as solvents it is interesting to note the increased use of the cresols in this connection, particularly in the Bregeat and Barbet recovery processes.

British Industries Fair Suspended.

THE decision to re-open the British Empire Exhibition in 1925 has resulted in the suspension of the London section of the British Industries Fair, which would otherwise have been held from February 16 to 27. The Birmingham Section of the Fair will, however, be held as usual.

British Sulphate of Ammonia Federation

Chairman's Review of the Year

The feature of the annual meeting of the British Sulphate of Ammonia Federation, held in London last week, was a comprehensive review by Mr. Milne Watson (the chairman) of the important developments of the past year.

THE fourth annual general meeting of the British Sulphate of Ammonia Federation, Ltd., was held on Thursday, November 20, at the head office, 30, Grosvenor Gardens, London. Mr. D. Milne Watson (chairman of the company) presided.

The Secretary having read the notice convening the meeting, and the report of the auditors, the Chairman said :—

The salient features in the sulphate of ammonia market in the year under review have been a large increase in consumption and a considerable fall in price. At first sight it may appear bad business, from the maker's point of view, to secure an 8 per cent. increase in consumption at a cost of 10 per cent. in the price. It was, no doubt, this consideration which prompted a critic some months ago, when comparing the methods of selling adopted by makers of nitrate of soda and sulphate of ammonia, to draw inferences unfavourable to the latter. The criticism implied that the method of maintaining prices selected by the nitrate makers might be applied with equal success by the sulphate makers. Let us examine this assumption. The nitrate makers have succeeded in keeping up the price of nitrate by reducing their production during the last four years by a quantity of about 2,000,000 tons : a reduction of practically one year's production in four. This method is both justifiable and practicable where you have a natural deposit which does not waste away by being left in the earth. But it is clearly unjustifiable and impracticable where you have to deal with a by-product of daily and indeed hourly production : it is also economically unjustifiable and therefore inapplicable to the case of makers who produce their nitrogen synthetically.

Two Groups of Nitrogen Producers

I have referred to this criticism because consideration of it helps to bring out the important and fundamental factors which govern the nitrogen market.

You have two main groups of nitrogen producers. The first group, the nitrate group, an aggregate in Chile, bound naturally by the ties of homogeneous production and geographical propinquity, and artificially by membership of an association representing nearly 100 per cent. of the production. The second group, the sulphate group, a dispersion throughout the countries of the world consisting of units, heterogeneous in method and quality of output, disparate in aim by reason of national and individual jealousies, united only in the common determination to produce as much nitrogen as possible. As the total output of group two now exceeds the production of group one, it is clear that cataclysms in price can only be avoided if the elements in group two can be subjected to a considerable measure of organisation. Without such organisation it is clearly impossible for any common policy to be adopted either as regards method of selling or propaganda.

Now there are in France, Belgium, Holland, Germany, Italy, Japan, and Australia organisations similar to this Federation. And that fact has made it possible for these organisations and ourselves to endeavour to frame a policy which has for its chief objects the establishment and maintenance of a reasonable price calculated to induce consumption on the largest scale, and also the combining of propaganda effort,

During the last 18 months or so there has been an increase in consumption of nearly 200,000 tons of sulphate of ammonia on a total world production of, roughly, 2,500,000 tons, and this increase has been secured at a comparatively small sacrifice in price.

These facts show, I think, that the existing organisations, including your Federation, have achieved a considerable amount of success.

Indian Makers Join Federation

We ourselves have received practical recognition of the value of organised effort, not only by the increase in our membership at home, but also by the adherence of producers in South Africa and of makers representing practically the whole of the output of sulphate of ammonia in India. We can, therefore, justly claim that there has been a satisfactory and steady increase in the membership of the Federation ever since its formation.

I believe that if our efforts are supported by all British makers of sulphate of ammonia, and if the similar organisations in other countries, to which I have referred, succeed in maintaining and extending their membership, then the makers of sulphate of ammonia, the world over, should have no difficulty in finding outlet for all the nitrogen which they can produce at a reasonable level of price.

In our reports we have given our reasons for thinking that a very large increase in the world's consumption of nitrogen is likely to take place within a comparatively short space of time. The great step forward towards an improvement in international relationships which has been taken as a result of the London conference and the putting into practice of the Dawes Report should certainly stimulate the desire for a higher standard of living, which can only be satisfied by the use of more nitrogen.

An Appeal to Non-Members

Nevertheless, it is clear that ever increasing efforts will have to be made by the Federation and kindred bodies in the field of propaganda, if consumption is to be increased sufficiently rapidly to absorb the large fresh supplies of nitrogen which will be available shortly both here and abroad. For this reason we propose to ask you to-day to sanction a substantial increase in our propaganda expenditure.

The foreign organisations to which I have referred are also increasing their propaganda activities, and therefore I would like to make a very special appeal to non-members, whose total production amounts to less than 10 per cent. of the output in this country, to join the Federation, and to makers in other countries who have held aloof from the central organisation in their country, to join that organisation.

By doing so they will make it possible for these organisations and ourselves to carry through a reasonable and logical programme, beneficial alike to consumer and producer.

By refusing to do so, and by continuing to sell where they like and when they like, they introduce into the nitrogen market an element of instability and uncertainty. The least harmful result of this individualism, when the quantities are small, is loss to themselves. But when the quantities are considerable, their operations produce chaos in the market, inflict loss alike on distributing and producing organisations, and actually tend to reduce consumption by inducing farmers to postpone their orders until too late, in the hope of obtaining an advantage in price.

Larger Home Demand

You will see from the report that the consumption in Great Britain and Ireland was further increased last season. That I think shows that farmers appreciated that our prices were favourable. We have been criticised in the Press because during a period of the year under review our home price was higher than our export price. The report shows that our average export prices have yielded us a better result than the average home prices. Experience has taught us that we can only hope to secure a maximum home consumption by arranging a reasonably low price for British farmers and maintaining that price through a sliding scale which gradually rises in the winter and spring. This arrangement enables the agricultural merchant to make provision in good time for the requirements of his customers without fear of loss, and it also tends to prevent farmers from waiting until too late before placing their orders.

Seeing, however, that buying for home agricultural purposes goes on throughout the year, it is necessary to fix the lowest price of the scale nearly a year in advance. It is inevitable, in these times of erratic foreign exchange and variable incidence of supply and demand, that there should be months in which the home price, rising according to scale, becomes temporarily higher than the export price.

I can assure you, however, that our policy in regard to the home market remains unchanged. We have always, in the past, given British farmers specially favourable terms, and we propose to continue to do so in the future.

Reduction in Home Prices

I mentioned just now that last year, as in previous years, we obtained a better financial result from our export trade than from our home trade. Our home price was, in fact, nearly 40s. per ton—over 11 per cent.—lower than our price for the previous year. The cost of a unit of nitrogen was lower in the home price for sulphate of ammonia than in any other nitrogenous fertiliser. This fact, coupled with the special efforts which we have made to increase the efficiency of our propaganda work at home, no doubt explains why the home demand for sulphate of ammonia has increased, whereas there has been a falling off in the deliveries of nitrate of soda and other nitrogenous fertilisers.

Increase in Production and Exports

You will observe that British production of sulphate of ammonia increased last year by about 18 per cent. The production is now rather larger than it was in 1913, and we may look forward to a further increase in the future both from synthetic sources of production and also from by-product ovens.

The deliveries which we have received from Synthetic Ammonia and Nitrates, Ltd., Billingham, have been regular and satisfactory in quality, and the problem of the synthetic production of ammonia on a commercial scale may be regarded as definitely solved as far as they are concerned.

While the home market has absorbed a small portion of this increased production, I am pleased to be able to record a large expansion in our export trade. The tonnage exported during the year was larger by 37 per cent. than the total for 1922–23, and Japan absorbed the bulk of the increase.

The great increase in the demand for nitrogen in Japan during the past ten years is of good augury for similar developments in other Far Eastern countries. For this reason we have begun to devote special attention to propaganda work both in China and India. While we cannot hope for immediate results in those countries, we are convinced that within a few years they will require to use very large quantities of nitrogen.

In Japan I am afraid we must look for a temporary setback owing to financial difficulties caused by the losses inflicted by the great earthquake of 1923.

Improved Quality

The report shows that we have continued to devote attention to the question of quality. Well over 80 per cent. of the total British production is now of neutral quality, and I think I am correct in saying that all large makers in the country are either actually producing an acid-free salt or have ordered the necessary plant to enable them to do so.

That is a great improvement on conditions obtaining in the sulphate of ammonia market a few years ago. Experience is showing us, however, that further improvement in quality is possible, and our members are now making special efforts to increase the size of the crystals in their salt and to take steps to prevent risk of caking.

Acid Prices Lower

I devoted a considerable portion of my remarks last year to the question of the price of sulphuric acid. I think we may say of that question, *Solvitur ambulando*. There has been a substantial reduction in prices in some districts, and reports are reaching us from various parts of the country that our members have been able to secure supplies at lower prices. While we still consider that the price of acid is much too high, we expect that the law of supply and demand will eventually give us relief.

Low Cost of Administration

You will see from the report that the combined charge for administration and propaganda last year was 3s. per ton produced.

That is the total cost of the Federation to its members, and we believe that you are getting a satisfactory return on this investment. At any rate, it is our constant endeavour that you should.

In conclusion, I think we may claim that the result of last year's working has not been unsatisfactory to members of the Federation when all the circumstances are taken into account, and I feel sure you will agree that results would have been very much worse if the Federation had not existed.

On the motion of the Chairman, seconded by Mr. A. Read (Bolckow, Vaughan and Co., Ltd.), the report and accounts were adopted unanimously.

The auditors, Messrs. Thomson, McLintock and Co., having been reappointed, on the motion of Mr. R. Holliday (Ackton Hall Colliery Company), seconded by Captain A. Instone (S. Instone and Co., Ltd.), the Chairman said he regretted to have to announce the resignation of Mr. A. K. McCosh, vice-chairman, owing to pressure of other work, and paid an eloquent tribute to the services which Mr. McCosh had rendered to the Federation.

On the motion of Mr. A. Read, seconded by Mr. A. Stanley (Simon-Carves, Ltd.), the meeting then re-elected Mr. D. Milne Watson (The Gas Light and Coke Company) chairman, and Mr. E. J. George (Consett Iron Company, Ltd.) vice-chairman, and appointed Mr. S. Henshaw (Staffordshire Chemical Company (1917), Ltd.) to the vacant post of vice-chairman for the ensuing year.

The Chairman moved, and Mr. J. G. Nicholson (Brunner, Mond and Co., Ltd.) seconded, a cordial vote of thanks to Mr. Stanley and the other members of the Propaganda Sub-Committee and the staff.

Mr. Stanley and the general manager (Mr. F. C. O. Speyer) having returned thanks, the proceedings terminated with a vote of thanks to the chairman.

Mechanical Flue Cleaning Appliance

An Interesting Time-Saving Invention

STEAM boilers on a practical scale have been in use for over 120 years, and in spite of all the advances of science and engineering, particularly the substitution of the machine for hand labour, boiler flues in nearly every case are still cleaned out by hand.

This is a very crude proceeding, being a hot, dirty and intensely disagreeable job, which is both troublesome and costly from the labour point of view. Also the present method of cleaning, say every six months in the case of Lancashire boilers, has the general disadvantages that it results in a gradual accumulation of dust in the flues, which reduces the effective area, and of soot and dirt on the boiler plates, especially in the case of a fairly high volatile fuels, forming an extremely effective non-conductor of heat. The combined effect is apt to reduce the efficiency and evaporation of the boiler plant to a marked degree, especially if the flues are on the small side and a high ash content coal is used.

There has now, however, been perfected by the Boiler Tube and Flue Cleaner Co., Ltd., 238B, Gray's Inn Road, London, W.C.1, a simple device to carry out mechanically the whole operation of cleaning boiler and economiser flues at short intervals, say once per day, which is claimed to keep the flues and boiler plates in a permanently clean condition. The apparatus consists essentially of an arrangement of small bore steam pipes laid over the whole of the flues, having steam nozzles at short intervals, whilst the steam supply is controlled by a patent manifold valve placed in any convenient position, generally over the top of the boiler. This valve is then operated as required, say once every shift, the arrangement being such that in the case of a "Lancashire" boiler, for example, the steam is turned on momentarily first in the boiler furnace tubes and bottom flue section, blowing all the light dust that has accumulated from the previous shift in front of it. Then automatically, by the action of the manifold valve, the next section of nozzles comes into operation, and the whole of the dust in the entire flue circuit is blown eventually in this way right out of the plant either into a receptacle chamber or up the chimney. The total time of operation is two minutes, so that the amount of steam used is infinitesimal, whilst there is no trouble in discharging the fine dust from the chimney, if this is done every day, since the total amount is excessively small and it is spread over a wide area.

The apparatus is extremely simple and difficult to get out of order, either because of the heat or the dust, unlike some types of complicated mechanically driven suction apparatus on the vacuum cleaner principle that have been suggested from time to time. Also, no cold air is admitted to the flues during the operation of cleaning, the annual inspection of a boiler can be made ten hours after pulling out the fires, and there is a drain cock kept normally open between the steam supply pipe and the manifold valve, so that no steam or water can leak into the flues when the apparatus is not in use.

Luton Chemical Works Strike

To the Editor of THE CHEMICAL AGE.

SIR,—Referring to the letter of the National Drug and Chemical Union, which appears in your last week's issue, anent the above, we shall feel obliged if you will allow us to make a short reply.

We note that Mr. Gillian still persists in mis-statements with regard to wages. If it were not for these repeated mis-statements our reply would be merely to refer your readers to your issue of October 25, in which full particulars of wages are given.

To dispose finally of this matter, however, we enclose herewith signed duplicate of certificate of an independent firm of accountants, which proves that on the average our men receive over 1s. per hour, as against Mr. Gillian's statement of 8½d. to 10½d.

Reference is made in Mr. Gillian's letter to mess rooms and "decent working conditions." We have three mess rooms, and long before Mr. Gillian came on the scene a large central mess room, to accommodate our rapidly increasing staff of workers was projected, but was unavoidably held up because of negotiations with the local authorities regarding the site.

As regards sanitation and healthy situation, we do not fear comparison with any other chemical works in the kingdom.—Yours, etc.,

For B. LAPORTE, LTD.,
H. E. ALCOCK, Chairman.

[ENCLOSURE.]

Prudential Chambers, Luton,
November 3, 1924.

Dear Sirs,—We have examined your wages records in order to certify the correctness of the statement made in the circular to your shareholders dated October 21, 1924. For the purpose of ascertaining a correct average, we have taken for the shift workers a normal working week of seven shifts (paid for at the rate of 7¼ shifts), and a 52-hour week for the day workers. For the piece workers we have taken the actual amounts paid to 36 workers for the week ending October 1, 1924, and for the fixed-wage men (10 in number) we have taken the actual weekly wage paid without any extras.

We hereby certify that the average wage of 196 workers on the basis shown above is £2 16s. 4½d. per week.

We are, dear sirs, yours faithfully,
GODFREY, LAWS AND CO.

Messrs. B. Laporte, Ltd., Luton.

Tests of Water Gas Plant

To the Editor of THE CHEMICAL AGE.

SIR,—In his recent paper "A Critical Study of the Published Results of Tests of Water Gas Plant," Dr. Travers utilised the results of tests carried out by the Gas Investigation Committee of the Institution of Gas Engineers for the purpose of comparing the quantities of heat added to the bed of fuel during the blow periods and taken away during the run periods. Theoretically—when all factors are given their proper consideration—these two quantities should agree within certain limits of experimental error.

As calculated by Dr. Travers, the heat added to the fuel during the blow periods of the Gas Investigation Committee's Test D of the Tenth Report was 3·1475 millions C.H.U. units per ton of dry coke supplied to the generator and the heat removed during the run periods was 2·83415 million C.H.U. units. Although the difference is 0·31335 million C.H.U. units or about 10 per cent. of the heat added during blow periods, it represents less than 2 per cent. of the heat value of the fuel—15·7 millions C.H.U. units—supplied to the generator. The fuel supplied can only be weighed and sampled with certainty to within about 1 per cent. of the true value, so that the apparently large discrepancy approaches experimental error limit. Dr. Travers, however, endeavours to show how this discrepancy must have been caused by (1) combustion of carbon during clinkering or loss of solid carbon up the slack, or (2) the recording of temperatures of blow and run gases, much below their true values, or probably by both factors.

Dr. Travers then proceeds to make further calculations from the results of Tenth Report, Test D, on the assumptions that the recorded temperatures of the gases were 50° C. too low and that the carbon lost was equivalent to 5 per cent. of the carbon consumed during the blow periods, and *according to the figures derived* a true balance is obtained. The explanations (1) and (2) were thus put forward as definite conclusions.

With regard to these conclusions I must state emphatically that the extreme precautions taken during the tests of the Tenth Report preclude any possibility of the temperatures being in error to the extent of anything approaching 50° C.; further, it is highly improbable that so much carbon was lost during Test X.D. I have therefore submitted Dr. Travers' critical study to a careful examination and find that I am in disagreement with so many points in the paper that space would not allow me to deal with them all in this communication. I wish, however, to mention a few of the points.

I. The heats of reaction used by Dr. Travers are:—
(*a*) $C+2H_2O—CO_2+2H_2$ *minus* 20,900 C.H.U.
(*b*) $C+H_2O—CO_2+H_2$ *minus* 31,000 C.H.U.

The usually accepted figures are (*a*) *minus* 19,000 and (*b*) *minus* 29,000, which differ from Dr. Travers' figures by 10 per cent. in (*a*) and 7 per cent. in (*b*). Dr. Travers' figures would be obtained approximately by replacing amorphous carbon by diamond.

II. No account appears to have been taken of the heat expended by the blow gases in evaporating moisture from the coke as charged into the generator. The moisture in the coke supplied in Test X.D. was 10·8 per cent. and correction for this item alone would reduce the discrepancy from 0·31335 million C.H.U. units to approximately 0·09 million units.

III. The gaseous hydrogen which is derived from the amount of this element in the coke as supplied must also be considered. This point would affect both the heat added during the blow periods and abstracted during the run periods by approximately 0·24 million C.H.U. units.

It is thus clear from the points I., II. and III. just raised, quite apart from many other points which need not be considered at this stage, that Dr. Travers' paper is not based on a full and proper consideration of the subject.—Yours, etc.,

A. PARKER.

The University, Leeds.
November 26.

The Lyons Fair

To the Editor of THE CHEMICAL AGE.

SIR,—I beg to draw your attention to the fact that the next Lyons Fair will be held from March 2 to March 15, 1925, and that it will contain exhibits from upwards of twenty different countries—especially those of the manufacturing countries of Western Europe. The Fair was attended by over 3,000 exhibitors this year, and it is expected that this number will be exceeded in 1925. The majority of the exhibits were housed in the Lyons Fair Palace, the largest and most palatial building of its kind in the world.

Every known raw material and manufactured article can be bought at this Fair, and for the forthcoming Fair we are publishing an advanced edition of the official catalogue embracing about 90 per cent. of the total exhibitors for 1925. This catalogue has been completely translated into English, and is a valuable work of reference and should be in the hands of every manufacturer and merchant. A supply will be available in a few days, and will be sent, post paid, to any address in the U.K. and Colonies for 2s. 6d.

It is safe to say that the Lyons Sample Fair offers unrivalled facilities to the commercial buyer, and my services are at the disposal of anyone desiring further information. For the next Fair we propose to organise parties of buyers desirous of visiting, and we are arranging transport, accommodation, together with sightseeing programmes. Full information will be given upon request.—Yours faithfully,

T. J. CRADDOCK JONES,
Assistant Official Representative of the Lyons Fair for the United Kingdom.

77A, Queen Victoria Street, E.C.4.
November 24.

Progress in Artificial Daylight Uses

Modern Colour Problems

DR. LOUIS C. MARTIN, Lecturer in the Department of Optical Engineering and Applied Optics, Imperial College of Science and Technology, South Kensington, gave the first of a series of three Cantor lectures at the Royal Society of Arts on Monday, November 24. The problems of colour and light were entered into mainly from the physical point of view.

Discussing the attempts which have been made to produce artificial daylight, the lecturer described the work of Hayward in 1887, followed in subsequent years by that of A. P. Trotter, Dufton and Gardner, Wood, Ives and Luckiesh, Hussey and Sheringham. The daylight lamp bearing the last name was now well known and had been described on many occasions. It aimed at employing a suitably coloured reflector in conjunction with a gas-filled electric lamp, so that the excess of "cold" light from the reflector should compensate for the excess of red and yellow in the direct light from the lamp. It was found possible by exhaustive experiments to produce a lamp in which effective correction was secured by the reflection of all the light of the lamp from a reflector coated with certain pigments distributed in small areas in certain determined proportions. About 1919 Messrs. Chance Bros., of Birmingham, produced their daylight glass, which was employed alone in certain units for the correction of the light from gas-filled lamps. In order to keep the luminosity of the light transmitted, a slight excess of green transmission was tolerated by the manufacturers, but later Lamplough found it possible to correct this excess of green transmission by the use of gold as an ingredient in the glass or by the use of a supplementary filter of glass coloured to a light purple with gold.

Nevertheless, it must be realised that the great disadvantage of all the known methods of correction was the waste of a considerable amount of light—the excess energy of the longer waves. For units giving a reasonably accurate correction, a total light efficiency of 15 to 20 per cent. would be a good performance. Where only a partial correction was required, as in the case of many shop window displays, an efficiency up to 60 per cent. could be obtained. At the same time, for absolute accurate colour matching, the full colour correction must be used despite the low efficiency of the lamps.

It was also urged that in using daylight lamps of any description for any purpose, discrimination must be used in the matter of their position in relation to the articles to be illuminated. Many people placed such lamps near the ceiling, and thus did not get sufficient light upon the surfaces to be illuminated. For ordinary colour discrimination, apart from the most exact colour matching, 4 to 5 ft. candles on the surface of the material must be secured. Again, the opinion was expressed that the time saving to be effected by the use of daylight lamps was not fully appreciated yet in this country. Although the way was still open for further improvement in these lamps, the lecturer held the view that sufficient progress had been made to say that useful and practical results had already materialised. One of the psychological factors against the use of artificial daylight was the cold quality of the light as compared with ordinary artificial light. Dr. Martin said that if he were a shopkeeper he would not tolerate a lamp giving—as so many did—an apparently greenish appearance to the general effect. Probably a lamp with a slight cobalt glass would give the required increase of value to the blues in the display, without producing an undue coldness of the light. For accurate colour matching the eyes must be given time properly to adapt themselves to the light from the fully corrected units, and this probably required several minutes. The requirements for window display lighting by this means were thus totally different from those for producing the normal daylight effect.

The Mineral Resources Bureau

IT is proposed to amalgamate the Mineral Resources Bureau with the Imperial Institute. The Bureau, set up by Royal Charter in 1919 as an outcome of the Imperial War Conference, was designed to meet the requirements of direct contact with all countries and to be in touch with the industries and trade generally. The Bureau has fifteen advisory committees, concerned with different spheres of mining, minerals, and chemicals generally. Apart from the very valuable statistics and reports compiled by the Bureau, it has acted as a link between producers and consumer in all parts of the world and its effects on trade generally have been nothing but beneficial.

Society of Dyers and Colourists

Action of Heat on Cotton Fabrics

A MEETING of the Manchester Section of the Society of Dyers and Colourists was held on Friday, November 21, Mr. J. Huebner, M.Sc.Tech., F.I.C., presiding.

A vote of thanks was unanimously accorded the retiring chairman, Mr. William Marshall, for his services during his period of office.

A paper by Professor E. Knecht and Mr. E. F. Muller was read on "Some further observations relating to the Action of Heat on Cotton Fabrics," in which it was shown that when bleached cotton was heated for prolonged periods (up to 2,000 hours) to 90° C. the material was found to behave differently according as it was exposed in open, sealed, or evacuated and sealed glass tubes. In all cases the material had deteriorated in strength, the least affected being that in the evacuated tubes; nevertheless the latter specimens were scorched or browned more than the others. The deterioration was shown to be due partly to the action of heat *per se* and partly to oxidation. Discussing the question of the effect of higher temperatures, the "danger point" of a flat-iron was estimated to be in the vicinity of 250°.

In a subsequent paper on "The interaction of Glucose and Methylene Blue," by Professor Knecht and Miss Eva Hibbert, it was shown that the reducing action on the dyestuff in an alkaline medium could be measured quantitatively, and that this reaction could be employed as a convenient and rapid means for the estimation of glucose.

Cast Iron Research Association

IN the unavoidable absence of Lord Weir, Mr. H. B. Weeks presided at the third annual meeting of the Cast Iron Research Association in London on November 19. The Chairman laid stress on the great progress made during the year, and summarised the main developments, particularly the extended research programme and the establishment of a laboratory. The report and accounts were adopted, these showing a considerable improvement.

Sir John Dewrance was elected president for 1924–26, and the following were elected vice-presidents:—Mr. G. Pate (Falkirk), Mr. Summers Hunter (Wallsend-on-Tyne), Mr. F. W. Firth (Sheffield), Mr. C. E. Lloyd, M.P. (Dudley), and Mr. W. B. M. Jackson (Chesterfield). Commander C. W. Craven and Professor Turner were re-elected vice-presidents for a further year. A great tribute was paid to the services rendered to the Association by the retiring president, Lord Weir of Eastwood, who was elected an honorary member, and the retiring vice-presidents, Mr. M. Deacon, Vice-Admiral Sir George Goodwin, Mr. A. Laing, Mr. P. W. Petter, and Mr. Douglas Vickers.

Mr. A. J. Burn, Mr. F. J. Cook, Mr. T. Donaldson, Mr. N. B. Ellington, Mr. J. Haigh, Major C. Howl, and Mr. M. Riddell were re-elected to the Council. Dr. W. Rosenhain and Professor Turner were elected honorary members, and Dr. Rosenhain suitably responded, expressing the hope that there would be even greater co-operation in future between the Association and the Ferrous Alloys Research Committee. Delegates nominated by the leading technical institutions were elected, and thanks expressed to the professors and scientists who assist in the work of the Association.

X-Ray Tests for Metals.

AT the resumed inquest into the Liverpool-Blackpool express train accident, reference was made to the method of detecting flaws in metal by means of X-ray tests, as described recently in THE CHEMICAL AGE.

Replying to Mr. Jesson, solicitor, Mr. George Hughes, chief mechanical engineer, said that the question of speed had nothing to do with this accident.

Mr. Jesson inquired if they were not using the X-ray in America, and the witness said he believed that there was some research work going on in America, just as at Woolwich.

Mr. Jesson.—Do they not suggest in America that they are able to discover a flaw in a 3 in. tire?—I believe they do.

The witness added that at Woolwich Mr. Pullen, Director of the Research Department, had been able to examine up to three inches thick, but the apparatus was of very considerable magnitude, and the technical part of it was always very difficult. "I believe that to penetrate three inches you have to be encased in lead yourself," said the witness.

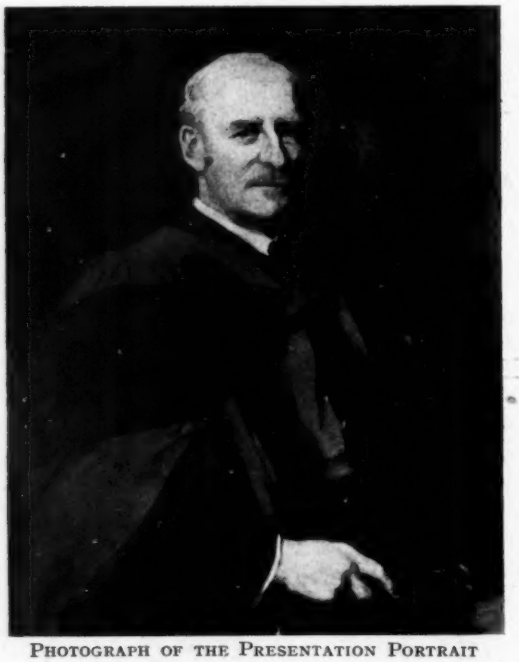
The Smithells Presentation

Interesting Ceremony at Leeds University

PROFESSOR ARTHUR SMITHELLS, C.M.G., D.Sc., F.R.S., who resigned last year the Chair of Chemistry he had held in the University and in the Yorkshire College for thirty-eight years, was the centre of an interesting presentation at Leeds University on Tuesday. Since his resignation a fund has been raised to provide a memorial to his work, and subscriptions amounted to £2,462. This sum has been devoted partly to the provision of a portrait, painted by Mr. Fiddes Watt, A.R.S.A., and intended to be hung with the other portraits of distinguished friends of the University, and, in addition, a scholarship of about £100 a year, to bear the name of Professor Smithells.

The Pro-Chancellor (Mr. E. G. Arnold) who presided, spoke of Professor Smithells as one of the foundation stones and principal pillars of the University.

Mr. A. G. Lupton, treasurer of the fund, who was Pro-Chancellor of the University during most of the period of Professor Smithells' tenure of office as Professor of Chemistry, presented the portrait.



PHOTOGRAPH OF THE PRESENTATION PORTRAIT

Professor J. W. Cobb pointed out that when it was decided to make Leeds a centre of University education, it was decided that not only was science to have a place of honour, but a Faculty of Technology was to be included. This was based upon the then essentially new idea that the principles operative in industrial processes could be made perfectly fitting subjects for university study, training, and research, if they were only treated in the proper way. The part which Professor Smithells had played in the development of this work should be freely recognised.

Professor Connal, as a colleague of long standing of Professor Smithells and a member of the Faculty of Arts in the University, and Mr. J. Ferguson Bell, M.Inst.C.E., of Derby, President of the Institution of Gas Engineers and representing the industry, testified to their appreciation of the work of Professor Smithells.

The Vice-Chancellor accepted the picture, and observed that though Professor Smithells had in his laboratory split the flame, he had in his work in the University kept alive the light of truth.

Professor Smithells' Speech

Professor Smithells, in acknowledging the presentation and referring to his association with the gas industry, observed that it commenced in a very simple way. It had been part of his scientific work to study combustion and flame. At an early stage of the gas industry he was asked to talk to members of that industry and interested himself in the problems of that industry. Speaking of his early days in Leeds, the Professor said that when he went to the Yorkshire College he found already a great tradition. The essence of the matter was there, and the right spirit had been disseminated by the four great men of science who initiated the work of the college—Green, Rücker, Thorpe, and Miall. Of these only one, Sir Edward Thorpe, survived. When consulted as to the scholarship which was to be founded with the gift made to him, he was inclined to think that it should be devoted to the encouragement of the study of Greek literature. Science, however, was only just beginning and was coming ahead with great rapidity, and they had it on the authority of a great literary man, Mr. Galsworthy, that the future of the race was in the hands of science. It was, therefore, natural that the scholarship should be devoted to the advancement of science.

The Pure Coal Briquette Process

Yields from Nigerian Coal

IN connection with the recent Smoke Abatement Conference at Manchester and the development of more efficient methods for the carbonisation of coal and the production of the maximum yields of paraffinoid liquid products and smokeless free burning fuel, a rather striking exhibit was to be found in the Nigerian section at the British Empire Exhibition, Wembley. This showed the native Enigu coal, together with sulphate of ammonia, motor spirit, heavy oil, and large briquettes of intensely hard smokeless fuel which light as easily as bituminous coal and yet otherwise approach anthracite in properties, all of which had been obtained by treating the raw coal according to the "Pure Coal Briquette."

The yield from 1 ton of the Nigerian coal, which is of excellent quality, treated on these lines is 79 lb. sulphate of ammonia, a remarkably high figure, 6 gallons of motor spirit, 36 gallons of heavy oil, and 12 cwt. of smokeless fuel in the form of briquettes having a specific gravity of 1·00 to 1·46 and a calorfic value of 12,000 B.Th.U.

It will be remembered that the "Pure Coal Briquette" consists essentially in roughly pulverising the coal and mixing it with 10-15 per cent. coke breeze or the breeze produced in the process—oxidised coal, or other product so as to give a blend that does not expand on carbonisation. This mixture is then briquetted at the extremely high pressure of 10 tons per square inch in a new patent and very powerful briquette press, the invention of Mr. E. R. Sutcliffe, without the use of the ordinary pitch or other binder.

The hard "Pure Coal Briquettes" so obtained are subsequently carbonised in a simple vertical continuous retort, with internal heating by means of a stream of inert gas and steam. The whole arrangement is simple and effective, and it is claimed that single retorts having a capacity as high as 500 tons can be used, with the enormous throughput of 50-60 tons of fuel per 24 hours, the gaseous and volatile matter evolved being passed out of the top of the retort to a by-product condensing plant in the ordinary way.

The briquettes can be carbonised on these lines because they do not soften or expand on heating as would be the case with the ordinary pitch briquette, and consequently there is no fear of the charge sticking. Further, the temperature of carbonisation is fairly high, 1,400°-1,600° F., which has the advantage that only 3-5 per cent. of volatile matter is left in the residual fuel, which means an extremely high yield of sulphate of ammonia, whilst the gas averages 10,000 cubic feet per ton of 500 B.Th.U. quality.

The residual fuel—in spite of its hardness and low volatile content—possesses very active chemical properties due to its fine grained structure and pronounced "surface action," so that it can be ignited with paper and matches like ordinary bituminous coal, whilst it is of course absolutely smokeless and burns with a very high radiant heat efficiency. Further, also, it possesses striking possibilities with regard to replacing metallurgical coke for blast furnace operation, and considerable interest attaches therefore to the fact that a large 100 ton per day plant is now being erected in Lancashire by Leigh Smokeless Fuels, Ltd., and will be in operation next year.

Academic Research and Industry

Dr. J. T. Dunn's Address to London Chemical Students

DR. J. T. DUNN speaking before students at the Chemical Association of the Northern Polytechnic, London, on Tuesday, November 18, took as his subject the relationship between "Research and Industry." He said that British industrialists as a body paid little heed to the progress of scientific discovery until 1914, when the war brought a sudden awakening. There was a need for greater production, better materials than those already available, substitutes for substances whose supply was diminished, and for munitions of war. The chemist became an important person in the community; so important was his work and that of his fellow scientists considered that a new department of the Government—the Department of Scientific and Industrial Research—was formed to encourage in every possible way the application of science to industry. The results had been so striking that it was difficult to imagine that our manufacturers would ever revert to the old order of things, or would cease to employ chemists or to submit their problems to their Research Associations.

Importance of Pure Scientific Research

This success of industrial work led to a danger of research in pure science being depreciated or neglected, and his purpose was to show that even for the purposes of industry, research in pure science was the most important thing. Industrial research was always directed towards the solution of a particular problem. Purely scientific research, on the other hand, was undertaken to satisfy the restless curiosity of the human mind to inquire into the causes of natural phenomena. It had no object other than this, and no end, as each discovery only led to further inquiries in new directions. From the narrow industrial point of view alone the results of purely academic research were usually much greater than those of research undertaken for a particular industrial end.

The classic example of this was the researches of Faraday upon electromagnetic phenomena. These were made without any practical end in view, yet without them the electrical industry as we know it to-day could not have existed.

Industrial Importance of Prout's Hypothesis

Dr. Dunn took another case in greater detail however—that of the discovery of a non-inflammable gas suitable for balloons. In 1815 Prout first enunciated the hypothesis that the atomic weights of the various elements known to chemists would prove to be whole numbers. The attempts to establish this failed, finally owing to the very accurate and masterly determinations by Stas. But after some years the fascination of Prout's idea again asserted itself, especially owing to the relationships between the elements embodied by Mendeleeff in his periodic classification. In 1882 Lord Rayleigh, speaking at the British Association at Southampton, said that the approximation of the atomic weights to whole numbers could hardly be entirely fortuitous, and suggested the question was one for further experiment. The relative atomic weights of oxygen and hydrogen were then re-determined by Cook and Richards, E. W. Morley and Alexander Scott. In the same connection Lord Rayleigh set out to re-determine the density of nitrogen, and found that pure nitrogen from chemical sources had a very different density from nitrogen obtained from the air. Lord Rayleigh and Sir William Ramsay then set out to find the reason for this and discovered that it was due to the presence of a hitherto unknown gas in the atmosphere, which they isolated and named argon.

The Discovery of Helium

Argon was then looked for in other places, especially where it might be mixed with nitrogen. One of the sources examined was a gas obtained from the mineral clevite. This, however, was found on spectroscopic examination to contain an element whose existence had previously not been known upon the earth, but had been "discovered" spectroscopically in sun many years before and named helium. Helium as obtained from clevite was found to be a very light gas, its density being only twice that of hydrogen, the lightest substance known. Other possible sources of helium were then looked for and it was found to exist in a proportion of nearly 2 per cent. in certain natural gases in America, with the result that helium is now used exclusively by the United States Government for filling airships because it is non-inflammable.

If one imagined say, in 1880, that there was a demand for a light non-inflammable gas, a director of an Industrial Research Association, Dr. Dunn pointed out, would hardly have looked to the extremely recondite speculation of a natural philosopher in regard to the constitution of matter as a likely starting point.

Poisoning Risks from Tetra-Ethyl-Lead

Investigation by U.S. Bureau of Mines

THE deaths resulting recently from the manufacture of tetra-ethyl-lead in the U.S.A. has caused considerable public anxiety as petrol containing a small percentage of the anti-knocking compound has been in common use in some districts for some time. The Bureau of Mines has been investigating the possible dangers to public health through the addition of this compound to motor fuel. The risks would appear to be threefold :—(1) The danger in the manufacturing and handling of the concentrated tetra-ethyl-lead. (2) The possible risk in handling the ethyl gasoline (one part of tetra-ethyl-lead to one thousand parts of petrol). This possible risk may affect those handling ethyl gasoline. (3) The possible danger due to the exhaust gases from motors using ethyl gasoline. This possible risk concerns the entire public.

The scope of the work undertaken by the Bureau of Mines included an investigation of all these possible dangers as outlined. The first two, namely, that of the danger in the manufacture and handling of the concentrated tetra-ethyl-lead and the possible risk in handling the ethyl gasoline as sold to the automobile driver, are now being investigated. Sufficient data has not yet been obtained to draw conclusions. As soon as this investigation has been completed the results will be made public.

The last of the above outlined problems, namely, the possible hazard due to the exhaust gases from automobiles using ethyl gasoline as ordinarily sold has been carried on for more than ten months. The plan of investigation was that of exposing various types of animals (pigeons, guinea pigs, rabbits, dogs and monkeys, over 100 in all) to a definite concentration of exhaust gas from an engine using ethyl gasoline. The concentration of exhaust gas in air was that which, when coming from the average automobile, would be four parts carbon monoxide in ten thousand parts of air; this concentration would be allowable for only a period of one hour's exposure from the standpoint of carbon monoxide. The concentration of exhaust gas in air used was such as to exceed that known to exist in ordinary traffic of a city street. The carburetter was adjusted so that the carbon monoxide content of the exhaust gas from the engine used was less than one-half that found in the average automobile exhaust gases.

The animals were observed throughout the entire test period for symptoms of lead poisoning, as colic, paralysis, loss of appetite and loss of weight. Also, a careful examination of the blood was made for characteristic signs of lead poisoning. At various times animals were killed and the entire tissues examined for effects of lead and analysed for stored-up lead. After a period of approximately eight months' daily exposure to the above conditions there was no indication of lead poisoning and the animals continued to grow and mature at a normal rate. The investigation indicates the apparent remoteness of any danger of undue lead accumulation in the streets through the discharging of scale from motor traffic.

Columbia University, New York, is also engaged in carrying out tests of the poisonous nature of tetra-ethyl-lead. These are directed rather to ascertaining the danger to garage men and general users from the spilling of treated petrol or in its use for cleaning purposes, etc., where the vapours of the unburnt petrol are likely to be inhaled. The results of this research will be published in due course.

Tar and By-Products in Belgium

ACCORDING to a report from the Commercial Secretary at Brussels (Mr. J. Picton Bagge) to the Department of Overseas Trade, the market for coal-tar in Belgium is not only firm, but rising, both because of the good tendency of the English market and large purchases both at home and abroad. Available stocks at the present time are practically nil and for the second quarter of 1925 they are very small. The demand is still very strong for by-products and the rise in prices is continuing rapidly. The works are well sold and there are no available stocks of benzol.

The Metallurgy of Nickel

The following notes are abstracted from the introduction to a monograph by W. G. Rumbold on Nickel Ores, issued by the Imperial Institute and published by John Murray.

THE nickel industry is of comparatively recent date. Although alloys of nickel have been found as Bactrian coins of the year 235 B.C., and ancient Chinese alloys of unknown age containing nickel and copper exist, the metal itself has only been produced on any considerable scale since the early part of the nineteenth century. Indeed, until after the discovery of the New Caledonian nickel deposits (about 1890) nickel was regarded as a somewhat rare metal, and its high cost prohibited its use except for a few special purposes.

The progress of the industry in later years is indicated by the fact that, whereas the world's total production of metallic nickel for the year 1900 was given as 7,526 metric tons, the production of Canada alone, estimated at 80 to 85 per cent. of the world's output, for 1918 amounted to 48,886 short tons.

As to the many uses for nickel, it is stated that upwards of 75 per cent. of the total output is employed in the production of the various kinds of nickel-steel alloys known under the general term of "nickel steel."

The addition of nickel in the manufacture of steel imparts various special properties to the product, depending upon the proportion in which it is added, and also as to whether one or more of the elements, manganese, chromium, tungsten, molybdenum, vanadium and titanium enter into the composition of the steel alloy. When nickel alone is added to an ordinary carbon steel in small proportions it largely increases its tensile strength and elastic limit. As an example, it might be mentioned that it has been calculated from comparative tests that by using a steel containing from 3 to 4 per cent. nickel, instead of an ordinary carbon steel, for the principal members of a steel bridge, a saving in weight up to 25 per cent., and in cost of 17 per cent., could be effected.

The value of nickel steels in industrial engineering is rapidly becoming more appreciated, and it is safe to anticipate a progressive increase in their employment, as their cost of production is cheapened.

High Cost of Metallic Nickel

The cost of metallic nickel is high, owing to the comparative scarcity of nickel ores, their low nickel content, and the somewhat costly metallurgy of the extraction of the nickel from them. On the other hand, certain nickeliferous iron ores contain nickel in sufficient quantities to yield ultimately a low nickel steel of good quality, the value of which is enhanced by the presence of chromium, which almost invariably accompanies the nickel. Such ores exist in enormous deposits in various parts of the world, the most notable being in Cuba, Greece, Borneo and Celebes.

Another possible source of low nickel steel, which has not yet been exploited, is in the blast furnace slags resulting from the smelting in Ontario of the Sudbury nickel ores.

Of all known deposits of nickel ore these Sudbury deposits are by far the most important. At the end of 1916 it was stated that the ore which might ultimately be obtained from them would probably exceed 150 million tons, which would be sufficient to maintain the normal annual output for a century.

Other known deposits of nickel ore within the Empire are in Tasmania, South Africa, India and Egypt. So far as they have been explored, they appear to be comparatively small, and as sources of supply of nickel ore are not likely to be seriously exploited so long as the large Sudbury deposits are available. Nevertheless, they constitute a useful mineral asset.

Of nickel deposits in foreign countries those of New Caledonia are second in importance in the world to those of Sudbury. Large quantities of ore have already been mined, and there is no doubt that considerable supplies of payable ore are still available.

The Ores of Nickel

Of the various ores of nickel *Pentlandite* is the most common at Sudbury, where it is intimately associated with pyrrhotite and chalcopyrite. Its composition varies greatly as its iron and nickel contents are mutually replaceable. *Niccolite* is the most common arsenide mineral of nickel, but although widely distributed is rarely found in large quantities. The German name for this mineral is *kupfernickel*. Only second in importance to pentlandite are the silicate minerals of nickel of which *garnierite* is typical. These minerals are of very uncertain composition; the nickel and magnesium contents are mutually replaceable, and the proportions may vary widely in different specimens.

Metallurgy of Nickel

The ores of nickel, whatever their type, do not readily lend themselves to ordinary methods of concentration. It has been stated that flotation methods have been partially successful with nickel ores, but these methods are not known to be used either at Sudbury, Ontario, or in New Caledonia. The usual metallurgical practice is first to smelt partially roasted ore directly in blast furnaces to obtain a matte of iron, copper and nickel, which practice, while costly, has the advantage of a high recovery of the nickel content, and also of collecting the greater portion of any precious metals the ore may contain. This is, therefore, both a concentrating method and a stage in the reduction of the nickel ore to metal. The second stage of nickel extraction starts with the treatment of the nickel-copper-iron matte, and is much more complicated.

The preliminary roasting of a nickel sulphide ore is usually open or heap roasting. The object sought is to remove a portion only of the sulphur content; sufficient sulphur must be left to combine with the nickel, the copper and some of the iron in the next operation, which consists of smelting the partially roasted material with due proportions of coke and flux in a blast furnace. The pyrrhotite in these ores is almost entirely converted to silicate of iron in the blast furnace, and the composition of the slag is from 30 to 40 per cent. iron (combined with silica), 0·3 to 0·4 per cent. nickel and 0·2 per cent. copper. Evidence was given to the Royal Ontario Commissioners to the effect that these slags might profitably yield a nickel-copper steel of good quality, more particularly if worked as an adjunct to the smelting of the nickel ore, rather than as an independent operation.

The normal annual production of this slag at Sudbury is upwards of 1¼ million tons, containing from 5,000 to 6,000 tons of nickel and about half that quantity of copper. This might be expected to yield about 500,000 tons of steel, containing approximately 1 per cent. nickel and 0·5 per cent. copper. The typical matte obtained at Sudbury from the blast furnace contains 16 to 17 per cent. nickel, 7 to 8 per cent. copper, 45 per cent. iron, and 26 per cent. sulphur.

The matte, while still molten, is taken to a converter in which a blast of air oxidises the greater portion of the iron, so that with the fluxing material used, it forms a slag containing 3 per cent. nickel. This slag is added to a blast furnace charge. The matte now consists of a mixture of practically iron-free copper and nickel sulphides.

The treatment of enriched matte to produce refined nickel has hitherto been carried out by three principal methods known respectively as the Orford, the Mond and the Hybinette methods.

Orford Process.—The matte is fused with a given quantity of sodium sulphide, the result of which is that the upper and more fusible layer will contain most of the copper and the iron, if any, and the bottom layer, nickel sulphide chiefly. The separation can be made practically complete by one or two repetitions of the fusion. The two products are tapped separately from the melting furnace. The nickel sulphide is washed, dried and roasted with salt. By this treatment it is converted into insoluble oxide, while the copper is converted into a soluble chloride and can be dissolved out.

The nickel oxide is reduced to a form of nickel suitable for marketing.

The process is said to yield nickel 99 per cent. pure, but is believed to result in the sacrifice of a large proportion of the precious metals. It is by a modification of this process that the valuable alloy of nickel and copper known as monel metal is produced.

An Ingenious Process

Mond Process.—The Mond process is one of great ingenuity, and depends upon a series of remarkable chemical reactions. The bessemerised or converter matte is roasted down to about 2 per cent. sulphur. This treatment is followed by a leach with a 10 per cent. solution of sulphuric acid, by which about 70 per cent. of the copper content is dissolved out, but very little of the nickel. The solid residue, washed free of

acid, is transferred to the top of a "reduction" tower, in which it slowly descends, meeting in its passage an upward stream of water gas. This gas reacts on the nickel oxide at a temperature of about 350° C., and reduces it to metallic nickel. The reduced material is then passed to another tower known as the "volatiliser," in which a temperature of 50° to 80° C. is maintained, and it is here brought in contact with producer gas rich in carbon monoxide. The carbon monoxide reacts with the finely divided metallic nickel to form a volatile compound called nickel carbonyl, $Ni(CO)_4$ which passes out of the tower mixed with the producer gas. This mixture is led through "decomposing" towers, heated internally to 200° C. At this temperature the nickel carbonyl dissociates into nickel and carbon monoxide. The nickel is collected by passing the heated gas, containing nickel particles in suspension, through a mass of nickel granules, on which the nickel deposits in concentric layers. The granules, which have reached a given size, are removed by screening and are marketed as such.

The process yields a very pure nickel; the whole of the precious metals in the matte is recovered and the copper finds a market as copper sulphate.

Hybinette Process.—The Hybinette or electrolytic nickel-refining process originated in Norway, and by this method the concentrated matte is roasted and extracted with acid as in the Mond process. The solid residue contains about 65 per cent. nickel, 3 to 8 per cent. copper and traces of iron, and is melted down and cast into anodes. Cathodes consisting of iron plates coated thinly with graphite are used, and an electrolyte, which is a solution of 45 grams of nickel sulphate per litre, practically free of copper.

The current employed is a direct one, and the voltage is 160 to 170. As electrolysis proceeds the electrolyte becomes enriched in copper and requires treatment for its removal. The nickel deposits on both sides of the cathode, and when it has reached a thickness of ⅛ in. it is stripped off in sheets which weigh about 20 to 30 lb. each. The nickel is about 99 per cent. pure, but a higher degree of purity can be reached if desired. The precious metals pass into the anode slimes, and are recovered. The copper is recovered partly as cement copper, as mentioned above, and partly as electrolytic copper.

Uses of Nickel

One of the most largely used of the less common non-ferrous metals, nickel is employed mainly in the form of alloys with other metals, particularly in nickel steels; but also, to a much lesser extent, in the form of metal. Owing to its non-corrosive properties nickel is used for cooking utensils, and for evaporating basins, crucibles and other small articles used in chemical laboratories and works. Larger pieces of apparatus are sometimes made of iron with a nickel lining, while a further quantity of metal is employed for electro-plating articles of iron, steel, zinc, brass and many other alloys. Latterly it has been found possible to electroplate aluminium with nickel, which formerly could not be done. A large number of small articles of general utility are made of nickel, and several European and other countries employ unalloyed nickel for coinage.

Comparatively new sources of solid edible fats, and also of some other fats suitable for the soap and candle making industries, are to be found in the form of "hardened" or hydrogenated oils. Under suitable conditions liquid oils, in the presence of hydrogen and certain catalytic agents, may be transformed into hard fats of various melting points, the hydrogen being absorbed by the unsaturated fatty acid constituent of the oils. Various substances act catalytically to accelerate this reaction, but of these only nickel and certain of its compounds appear to be sufficiently active for commercial use.

Nickel may also be employed as a catalyst in the enrichment of water-gas; in the presence of nickel, and at 250° C., the carbon monoxide and hydrogen constituents interact to form methane and water, thus producing a gas of smaller volume, but with a much higher calorific value.

A further application of nickel as a catalyst, which may prove to be of considerable importance, is the result of a recent discovery that naphthalene and hydrogen in the presence of nickel can be converted into a series of compounds according to the number of hydrogen atoms which combine with the naphthalene molecule. When this number is four, the compound known as tetralin is formed.

The "Turbine" Furnace at Cardiff

(From a Correspondent.)

At this year's annual Engineering Exhibition at Cardiff, under the auspices of the South Wales Institute of Engineers, a very old-established and well-known society, the Turbine Furnace Co., Ltd., 238B, Gray's Inn Road, London, W.C.1, have an interesting display. This comprises in the first place a full-size "Turbine" furnace equipment for "Lancashire" boilers on the new "slot" element principle, whilst there are also shown photographs of the furnace applied to almost every other known type of boiler, including water tube, locomotive, vertical and marine types, in addition to samples of the wide range of fuels burnt, and many performance records showing the economies effected all over the world. Incidentally, also, information is available concerning the operation with kilns, and the matter is of considerable interest to the chemical engineer in connection with stills and similar plant.

Every steam user is also concerned with the second portion of the display, the "Vulcan" steam jet boiler flue cleaner for doing away with laborious hand labour entirely in the cleaning of boiler and other furnace flues whilst always maintaining them in a permanently clean condition. It will be remembered that the general principle of the latest "slot" design of the "Turbine" furnace is a series of longitudinal cast-iron trough firebars, of any desired length, placed side by side, forming the grate, each trough having its own independent super-heated steam nozzles and a large number of small interlocking transverse firebars or "elements," which rest on the trough sides. The elements have nine air slots or holes between, of a special shape, so that a standard 6 ft. by 3 ft. grate for a "Lancashire" boiler contains about 52 elements in each trough firebar and has altogether over 2,500 air slots. Consequently the air supply to the fuel bed is so sub-divided and evenly distributed that a very powerful forced draught can be employed even with the most difficult low volatile material such as anthracite dust, since the fuel is not blown off the bars before it is burnt and cannot fall between. The whole design also is such that the draught at every portion of the furnace, both longitudinally and transversely, is absolutely even because of the "turbine" design, a problem which has been very difficult to solve, the natural tendency with forced draught furnaces being for the back part of the grate to do most of the work, whilst also the draught is not the same at the side and the middle.

The "Turbine" furnace will burn every description of refuse and difficult fuels just as it will, of course, good quality coal and coke, and amongst the other advantages claimed are that the steam consumption at the nozzles is less than 3 per cent., the bars last for years, practically as long as the boiler, the ash is granular because of the action of the steam, and there are no complicated accessories in the way of engines, motors, fans and trunking, with nothing to project into the firehole.

Research and Industrial Prosperity

Dr. H. H. Hodgson, head of the Colour Chemistry Department, Technical College, Huddersfield, gave an address on "The Research Situation—a Criterion of National Stability," to the members of the Society of Dyers and Colourists (Scottish Section) on Friday, November 21. He said that, briefly stated, the national problem was to provide a means, other than that of wage reduction or increase of hours of labour, whereby our share of world trade could be made sufficient for the needs of our 50,000,000 people. New inventions could confidently be expected in the domain of chemistry, and our research policy would henceforward determine our national fate. A survey of our present activities showed marked progress of the Department of Scientific and Industrial Research, but we still lacked the provision of institutions devoted entirely to research without limitation, such as were contemplated by Francis Bacon in 1608 and later by Sir David Brewster, but which Germany alone had translated into actual fact. The conclusion was drawn that only by means of a system of research colonies linked with the educational system would the unemployed problem receive anything approaching an economic solution.

Gold from Mercury

Professor Haber's Report on German Experiments

GERMAN scientists apparently have so far failed to convert quicksilver into gold, according to a report to the American Chemical Society from its Cothen correspondent.

Professor Haber tested, the Cothen report states, seventeen samples of quicksilver which were given to him by Dr. Adolf Miethe, of the Charlottenburg Technical College of Berlin, and his collaborator, Dr. H. Stammreich, "and was unable to detect gold."

The report gives what is called the first detailed information from Dr. Stammreich on the disintegration of the mercury atom. It describes the experiments conducted by him and Dr. Miethe between May 6 and May 22 with A. Jaenicke's quicksilver lamp, giving full details of the apparatus used, the preparation of the burner, and the precautions necessary. An exact duplicate of this apparatus has, it is reported, been taken to America for use in experiments similar to those going on in Germany.

"In the quartz dish used (weighing fourteen grams) there was no gold, but ·000006 grams of silver," says the report issued by the American Chemical Society. "As material for filling the lamp 'Kahlbaum' quicksilver was used, and two kilograms of this material contained ·00000179 grams of silver and a very small quantity of gold, not enough to determine quantitatively. This quicksilver was subjected to slow distillation in vacuo. The distillate was free from gold, but still contaminated with traces of silver. A further distillation gave a material free from noble metal, of which 1·52 kilograms (a little more than three pounds) were used in filling the lamp. The lamp burned for 197 hours without interruption. The electrode potential varied over an average arc of 158 millimetres (about six inches), and at a density of 12·6 amperes between 160 and 175 volts. The emptying of the burner after cooling was done very carefully, as experience showed that gold-carrying viscous droplets of quicksilver were fastened stubbornly to the walls. The mercury from the lamp was subjected to a careful and very slow vacuum distillation; from the last drops of quicksilver ·000082 grams of gold were recovered. The experiments, of course, need severe tests. Professor Haber, after testing seventeen samples of quicksilver, which were given to him by Miethe and Stammreich, has been unable to detect gold."

Works Methods of Sampling for Analysis

AT a meeting on Tuesday evening of the Metallurgical Society of the Sir John Cass Institute, Aldgate, London, Mr. T. G. Howard, A.I.C., discussed the matter of "Works Sampling." In general, he said, whatever material was to be sampled the method used was essentially the same, and that consisted in taking small samples well distributed throughout the bulk, putting them together, sampling again, and analysing. In the case of fine materials, such as ores or chemicals, special sampling tubes were used so that the material at the bottom of a railway truck could be taken easily for the purpose. Materials of a coarser grade, mixed as lumps, rubble and smalls, should be graded for sampling purposes by taking a sample of each size separately. In the case of metals, pigs and ingots were usually drilled in various places and the drillings analysed. In the case of castings or other finished machine parts the usual method was to pick out one of a lot and take a drilling from it. The sampling for moisture in ores, etc., was most important, and samples for moisture should be taken separately and kept in air-tight tins until they were analysed.

In the discussion following the paper it was made clear that sampling methods had to be adjusted to the particular material in hand. Probably the perfect sample had never been taken, but in some cases the methods reached much nearer to perfection than in others.

Barytes Dealer's Failure

FREDERICK JOHN RYLAND, 196, Bishopsgate, London, who has been interested in the exploitation of barytes, attended for public examination at the London Bankruptcy Court on Tuesday last, his statement showing liabilities £2,586 and assets of no value. Debtor was formerly employed by a firm of lead manufacturers. About December, 1914, he began business on his own account as an agent, his chief object being to deal in barytes, the principal supplies of which had previously been imported from Germany. Later he acquired leases of four mines which he developed, installing plant to treat the ore, and thus obtaining the refined substance ready for certain manufacturing industries. In 1920 the Ryland Barytes and Silica Co. was registered and it acquired his interests in the mines. As vendor he received £6,000 in cash and the allotment of 15,000 £1 shares in the company. Of the latter, 8,500 were allotted to nominees, and he acted as a director of the company until the date of the receiving order. The debtor had also continued his mineral agency business, which was after acquired by another limited company, which went into liquidation in March last.

Since the early part of 1923 he had been chiefly engaged in maturing a scheme to amalgamate the barytes industry, but its fulfilment had been delayed owing to the unfavourable conditions prevailing on the money market. He attributed his failure and insolvency to bad debts, to the liquidation of the before-mentioned company, with consequent liability under guarantee to interest on borrowed money, to trading, loss, and to the non-fulfilment of the scheme that he had mentioned.

Foamite Firefoam Portable Extinguishers

A RECENT article on chemical fire-extinguishers in this journal showed that the Foamite Firefoam is one of the best of its kind having been developed especially for extinguishing oil fires. A tough and heavy foam is produced which effectually blankets the flames. A catalogue recently received describes portable appliances filled with this preparation. These range in size from 40 gallons to 2 gallons, producing 272 gallons and 16 gallons of foam respectively, so that wherever there is any risk of fire from inflammable oils, however small, the "Foamite" protection is available. For other fire risks the same company—Foamite Firefoam, Ltd., 24-26, Maddox Street, Regent Street, London, W.1—manufacture cheaper extinguishers of the soda-acid type. For oil storage tanks of course portable extinguishers should not be used, but the company's system of reservoirs and pipes should be installed to eliminate the fire risk as far as possible.

British Sugar Beet Progress

EXPERIMENTS in the home production of sugar beet seed have now been carried out by the British Sugar Beet Society for the last three years, under the supervision of Dr. Voelcker, and with the advice and assistance of Mr. Arthur Sutton, of Messrs. Sutton, Reading, and Messrs. Kuhn and Co., the Continental sugar beet seed producers. In 1922 "stecklings," or small beets, were produced from the best "mother seed" obtainable on the Continent. In 1923 commercial seed was produced from these transplanted beets. This year the seed so produced has been sown by 17 experienced growers in 11 counties, and the beets grown therefrom are in process of delivery to the factories, where the net yield per acre and the sugar content in the beets will be ascertained on behalf of the society. The result will be compared with the yield and sugar content of home-grown beets from commercial seed produced abroad from "mother seed" of the same stock. The society is still experimenting.

The Chemistry of Blood

A PAPER on "The Chemistry of Blood" by Mr. S. H. Edgar, B.Sc., was read at the last meeting of the University of Birmingham Chemical Society. The theories of coagulation were briefly reviewed, passing on to the chemical composition of blood as a whole, the blood pigments and compounds of hæmoglobin with gases. The connection of the latter with the function of respiration concluded the first portion of the paper. The remaining time was devoted to a survey of immunity from its chemical side. After dealing with the nature of toxins and anti-toxins, the formation of anti-bodies generally was discussed, reference being made to the use of the precipitin test in criminology. The paper concluded with a description of the way in which Ehrlich's side-chain theory is utilised to account for the problems of immunity, and the chemical defences of the blood.

From Week to Week

AN ORDER for the compulsory winding-up of the Yadil Press, Ltd., was made on Tuesday last.

PERMISSION TO ESTABLISH AN OIL REFINERY at Frindsbury is being sought by the Victoria Oil Refining Co.

LEAD SULPHATE PLANT, paint mills, tanks, etc., will be sold by auction at the Purex Works, Greenford, on December 2.

MR. HERBERT SHAW, of Shipley, until recently a director of the Bradford Dyers' Association, has died at the age of 51.

TEES-SIDE IRONMASTERS are co-operating with the Fishery Board in the provision of research into the question of river pollution caused by the discharge of poisonous effluents.

AN ASSISTANT PHYSICIST is wanted by the British Boot, Shoe, and Allied Trades' Research Association. Applications should be made to the Secretary, 50, City Road, London, E.C.1.

THE LONDON SECTION of the Institute of Chemistry is to hold its annual informal meeting and exhibition of books, apparatus and materials on December 17, from 6 to 10 p.m., at 30, Russell Square, London, W.C.

THE ANNUAL DINNER of the Oil and Colour Chemists' Association, which is usually held in May, is next year to be held on Friday, February 20. It is intended to be rather more of a social function than usual, and an attractive programme is being prepared.

THE INSTITUTE OF CHEMISTRY (Manchester and District section) announces a concert to be given at the Engineers' Club, Albert Square, on December 10, at 7 p.m. Early application should be made to Mr. R. S. Wishart, 12, Kingsway, Alkrington, Middleton, Manchester.

MR. H. T. CRANFIELD, senior lecturer in agricultural chemistry and head of the Chemical Department at the Midland Agricultural and Dairy College, has been appointed adviser in agricultural chemistry, under the Ministry of Agriculture scheme, for the Midland Counties served by that College.

LARGE DEPOSITS OF MANGANESE ORE are being mined in the Caucasus and in South Russia. The total output has been 14,500,000 long tons. The raw ore from the Caucasus averages 48 per cent. manganese. By concentration it is brought up to 52 per cent. The South Russia ore averages 45 per cent. raw and 48 per cent. when concentrated.

IT IS REPORTED that Lever Brothers, Ltd., have acquired a controlling interest in the large Norwegian fat-refining and hydrogenation factories, De-No-Fa, which have consequently taken up the production of soaps for the Norwegian and foreign markets. Lever Brothers have also built a new soap factory in Denmark, which recently has been put in operation.

THE DEATH TOOK PLACE on November 25, at his residence, Wynstone Place, Brookthorpe, nr. Gloucester, of Mr. John Martin Collett, J.P., chairman and founder of J. M. Collett and Co., Ltd., chemical manufacturers, of Gloucester. Mr. Collett was a fellow of the Chemical Society, a member of the Society of Chemical Industry and a former high sheriff of Gloucester.

A MESSAGE FROM COPENHAGEN states that the export of cellulose, mechanical pulp and pasteboard has contributed considerably to the highly favourable development of Finland's foreign trade this year. Each item shows considerable improvement over last year. In the period January-October 1924, 209,955 tons of cellulose have been exported against 157,312 tons in the corresponding period in 1923 and 188,791 tons in the whole of that year. The export of mechanical pulp in the same period was this year 63,806 tons (dry weight), against 43,478 tons last year, and the export of pasteboard amounted to 24,583 tons, against 18,627 tons.

THE U.S.A. TARIFF COMMISSION has filed a brief in the Court of Appeal of the District of Columbia in the Norwegian Nitrogen Products case. It will be recalled that the Supreme Court of the District of Columbia upheld the Tariff Commission in its refusal to allow the Norwegian company to see the cost production figures of American producers of sodium nitrite. The brief states that individual costs of production are trade secrets, that the granting of a mandamus would destroy the flexible provisions of the Tariff Act, and asks the court either to dismiss the appeal of the Norwegian Nitrogen Products Company or affirm the judgment of the lower court.

MR. GEOFFREY COTTON has been awarded the scholarship of the Institution of Petroleum Technologists awarded to a student member of the Institution.

MR. A. C. HARRISON, a director of Harrison and Son (Hanley), Ltd., colour manufacturers, has been appointed a justice of the peace for Stoke-on-Trent.

A NEW RESEARCH LABORATORY has been given to Cincinatti University by the leather industry of the United States as a war memorial. It was opened on November 19.

HIS MAJESTY'S GOVERNMENT has informed the Anglo-Persian Oil Company, Ltd., that it has no intention of disposing of the Government holding of shares in the company.

SIR BURTON CHADWICK, Parliamentary Secretary to the Board of Trade, states that a new Bill is being drafted to replace Part 2 of the Safeguarding of Industries Act dropped by the late Government.

AN ENGINEERING AND SCIENTIFIC CLUB, which it is hoped will focus the activities of the various technical societies connected with the metallurgical and other activities of the district, has been organised at Wolverhampton.

A NEW SWISS TRADING COMPANY, for the purpose of importing coal, coke and fuel principally from the Ruhr district and the Thyssen mines, and also oils, artificial fertilisers, and other by-products, has been formed under the name of Ruhrkohlen Import A.G., at St. Gall.

THE BRITISH COMMERCIAL COUNSELLOR AT WASHINGTON will attend the D.O.T. from December 8 to 12 to see manufacturers and merchants interested in export trade with the U.S.A. Reference 5518 T.G. should be quoted to 35, Old Queen Street, London, S.W.1.

THE ACREAGE OF SOYA BEANS GROWN in the Northern area of the United States has increased about 25 per cent. this year. The total United States acreage grown for the beans, rather than for forage, this year is estimated at 534,000 acres, compared with 452,000 acres last year.

A PUBLIC LECTURE by Sir Gregory Foster on "The University of London—What it is and what it may be," has been arranged by the XXth Century Society of London Graduates, to be delivered at the London School of Economics, Kingsway, London, on Thursday, December 4, at 8.15 p.m. Admission is free.

THREE KINDS OF SALT are now mined by the Polish Government—green, containing 93 per cent.; brown, containing 95 per cent.; and white, containing 99 per cent. of NaCl. The daily production is about 70 tons, and the principal markets for the salt are Germany, Czechoslovakia, Austria and the Balkans.

COPIES OF A REPORT on the bituminous sands of Northern Alberta, containing a description of the area underlain by bituminous sands; description of the deposit; particulars of sampling and laboratory determinations and of commercial applications, etc., may be obtained on application to the Department of Mines at Ottawa, or to the Office of the High Commissioner for Canada, Kinnaird House, Pall Mall East, London, S.W.1.

ARISING FROM THE SUFFOCATION of two French sewermen, said to be caused by gases evolved from waste tannery effluents, tanners have been informed that the effluents must be free from sulphide before entering the sewers. This order was found to be almost impracticable and had resulted in the stoppage of work at several factories. The Prefect of Police then agreed that the month's notice was too short and the treatment with chloride of lime not an industrial possibility. Tanners have been assured that sufficient notice will now be given and an order will be made regulating the sulphide content to one five-hundredth part.

A SUM OF $100,000 has been placed at the disposal of the Netherlands Government by the International Education Board of the Rockefeller Foundation. The grant is for the purpose of supplying the Natural Science Laboratory with special instruments and equipment to ensure the progress of the scientific researches to be undertaken by means of such equipment. The Rockefeller Foundation asked that a special annual subsidy of 10,000 florins should be placed at the disposal of the laboratory, 7,500 florins being to enable scientific workers to devote their time to researches, and 2,500 florins to cover general expenses. The gift has been accepted subject to these conditions.

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SULPHATES.—Normal and basic copper sulphate. A. Krüger. *J. prakt. Chem.*, October, 1924, pp. 278-296.

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ELECTRO-CHEMISTRY.—The production of antimony hydride (stibine) at an antimony cathode in alkaline solution. E. J. Weeks. *Rec. Trav. Chim. des Pays-Bas*, October 15, 1924, pp. 649-653.

COLOUR.—The quinone chromophore. Part III. J. Lifschitz. *Rec. Trav. Chim. des Pays-Bas*, October 15, 1924, pp. 654-670.

Patent Literature

Abstracts of Complete Specifications

223,624. CARBONISED FUEL, APPARATUS FOR THE MANUFACTURE OF. S. R. Illingworth, Bryn Fedwen, Radyr, Glamorganshire, and The Illingworth Carbonization Co., Ltd., 16, Kennedy Street, Manchester. Application dates, May 23 and October 29, 1923.

This apparatus comprises a brickwork retort having a number of heat conducting plates of H-section extending across it, and with the flues at the ends of the plates. The retort setting contains a number of tapering retorts between two and seven inches in width. The coal is supplied from a hopper into a number of measuring chambers closed at the bottom with sliding doors, each measuring chamber having a discharge pipe upon which slides another pipe of such diameter that it can enter a mould in the retort. The moulded fuel is discharged at the bottom into cooling chambers which are surrounded by flues through which pass the air or gas used for heating the retorts. Alternatively, the chambers below the retorts may be used for further carbonisation of the fuel. The chamber below the retorts can also be used as a gas producer, the hot gases from which are led to the flues surrounding the retorts. Small coal unsuitable for producer work may thus be used in the producer, or converted into smokeless fuel.

223,636. RESIN-LIKE CONDENSATION PRODUCTS, PRODUCTION OF. K. Tarassoff, 4, Dobroslobodsky Nereolok, Moscow, Russia. Application date, July 18, 1923.

These condensation products are produced from phenols, formaldehyde or its polymers, oil of turpentine, or other terpenic hydrocarbons, and naphtha sulpho-acids. It has been found that if a mixture of phenol and oil of turpentine and naphtha sulpho-acids, but without formaldehyde, is heated to 55°–75° C., the temperature then rises rapidly to 150° C., sulphur dioxide is given off and a tarry viscous dark brown liquid is obtained. This liquid after cooling may be treated with formaldehyde or its polymers, yielding resinous condensation products. The latter may be either (1) fusible and soluble in benzene, toluene, and similar solvents, but insoluble in alcohol; (2) infusible and very elastic when hot; (3) an elastic and very hard final product. The elasticity of the latter may be increased without destroying its hardness by adding vegetable oils such as castor oil. The product is sufficiently elastic at an intermediate stage to be given any desired shape, which is retained after hardening. The product may be obtained in the form of a varnish by adding sufficient formaldehyde, and also benzene, toluene, or other solvent to arrest the condensation. In an example, a mixture of phenol and oil of turpentine is heated to 70°–75° C. and naphtha sulpho-acid added. The mixture rises to 150° C. and boils. After cooling, formaldehyde solution is added and the mixture heated to 50° C. and continuously mixed to eliminate water. When dehydration is complete, the mixture is moulded and allowed to stand at 30°–40° C., and finally hardened at 105°–120° C. Examples are also given of the production of varnishes.

223,656. CENTRIFUGAL SEPARATORS FOR DEHYDRATING OR OTHERWISE PURIFYING OIL. De Laval Chadburn Co., Ltd., Wellington House, Buckingham Gate, London, S.W.1, and H. Johnstone, 3, Addiscombe Court, Addiscombe Road, Croydon, Surrey. Application date, July 25, 1923.

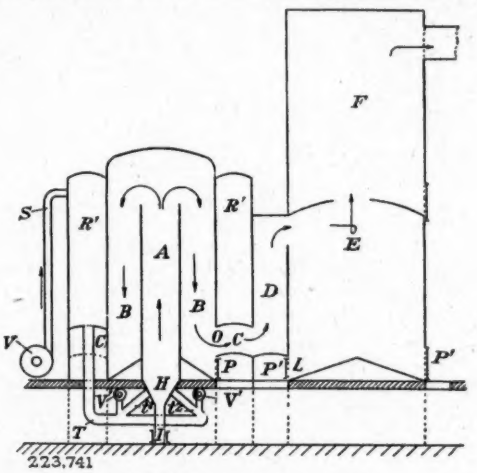
When oil is delivered from a centrifugal separator after dehydrating and purifying, it is usually in a highly aerated state, so that it has to be delivered to a temporary reservoir to allow it to de-aerate. To avoid losses of oil vapour into the air above this vessel, the delivery conduit of the separator is extended below the level of liquid in the vessel, so that the vapour is absorbed into the oil.

223,652. RETORT APPARATUS FOR THE TREATMENT OF MATERIALS SUCH AS SHALE, COAL AND THE LIKE. W. Guy-Pell, 12, Hyde Park Place, London, W.2. Application date, July 24, 1923.

To overcome the difficulty of obtaining uniform heating in retorts containing large masses of material there is provided a large number of ducts, the distance between the walls of which is small in relation to the total cross sectional area. These ducts are contained in a common heating flue. The ducts may consist of tubes having a diameter of 2–4 inches having their upper ends secured to a horizontal tube-plate. The tubes are vertical, and their lower ends extend freely through a lower partition to allow for expansion, or they may be secured to the lower partition which floats within a fixed part of the casing. The tubes may be provided with external scrapers to remove deposits, and with internal spiral devices to agitate the material.

223,741. ROASTING ORES, PROCESS AND PLANT FOR. A. D. H. L. Fassotte, Villa Merckem, Neerpelt, Belgium, and Compagnie des Métaux Overpelt-lommel, Soc. Anon., Overpelt, near Neerpelt, Belgium. Application date, October 26, 1923.

The process is for roasting sulphurous, arsenious, or other ores, more particularly blende, galena, iron pyrites, or speiss. The ore is crushed, and is injected into a roasting chamber while suspended in air, the chamber being maintained by the



heat of the reaction at the necessary temperature. Heated air is supplied through a lagged pipe T to two converging nozzles t^1, t^2, and the ore is supplied from hoppers by conveying screws V^1 to the nozzles where it is taken up by the current of heated air. The ore is injected into the expanding portion H of a narrow central column A, through which it passes upwards, and then downwards through an annular column B. The air is supplied by a van V through pipe S to a preheating chamber R^1, and thence to the pipe T. The air containing the roasted ore passes through outlets O to an annular collecting chamber C, and thence through the passage D to a settling chamber E, which it enters tangentially at a great velocity. The heavier particles of the ore settle in the chamber B and are withdrawn at the outlet P, while the lighter portions settle in the chamber E and are withdrawn through the outlets P^1. The air finally passes out through a dust-extracting chamber F. Particles of the ore which are too heavy to be maintained in suspension in the air current are withdrawn through the outlet I.

223,800. SOLUBLE BARIUM SALTS, PROCESS FOR THE PRODUCTION OF. A. Jahl and J. Michael & Co., 2-4, Mittelstrasse, Berlin, N.W.7. Application date, February 27, 1924.

The process is for producing soluble barium salts from barium sulphide. A solution of barium sulphide is incompletely saturated with hydrogen sulphide, and is treated with an alkali salt such as sodium chloride. A complex sulphur-containing barium compound is precipitated, and this is treated with a cold or warm saturated solution of the corresponding barium salt, *e.g.*, barium chloride, yielding the pure crystalline barium salt. The sulphur compound and sodium chloride remain in solution, which is again treated with barium sulphide and sodium chloride.

In an example, the solution of barium sulphide incompletely saturated with hydrogen sulphide may contain 85 grams barium sulphide and 400 grams barium hydro-sulphide per litre. 300 litres of this solution are heated and mixed with 96 kilos of sodium chloride. Impure barium chloride crystallises out on cooling, and the mother liquor is evaporated to precipitate a complex salt containing barium, chlorine, sodium, and sulphur, leaving pure sodium hydro-sulphide in solution. The impure barium chloride and this complex salt give pure barium chloride by washing with barium chloride solution.

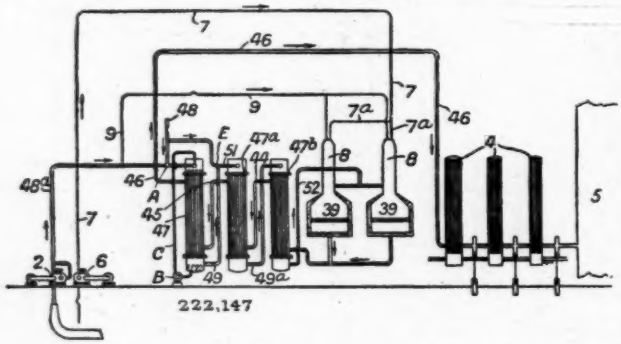
In another example, a solution of barium sulphide incompletely saturated with hydrogen sulphide is treated with crystalline barium chloride and sodium chloride, heated to boiling, and cooled, leaving pure barium chloride. The mother liquor is evaporated to precipitate the complex barium chloride salt, which is again treated with barium hydrosulphide.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—207,162 (Soc. of Chemical Industry in Basle), relating to manufacture of naphthalene derivatives and dyestuffs, see Vol. X., p. 101 ; 210,463 (Durand and Huguenin Akt.-Ges.), relating to manufacture of diazo dyestuffs, see Vol. X., p. 390 ; 216,110 (W. Ostermann and Sudenburger Maschinenfabrik und Eisingiesserei Akt.-Ges.), relating to the mechanical production of colloidal substances, see Vol. XI., p. 101 ; 219,272-3 (Nederlandsche Gist-en Spiritusfabriek), relating to production of non-peroxidising ether, see Vol. XI., p. 298.

International Specifications not yet Accepted.

222,137 and 222,147. AMMONIA SYNTHESIS. Synthetic Ammonia and Nitrates, Ltd., Billingham, Stockton-on-Tees, Durham. (Assignees of J. Dely, 11, Markland Avenue, Syracuse, N.Y., U.S.A.) International Convention dates, September 19 and September 21, 1923.

222,137. The nitrogen-hydrogen mixture used for the synthesis of ammonia by the de Jahn process is purified by

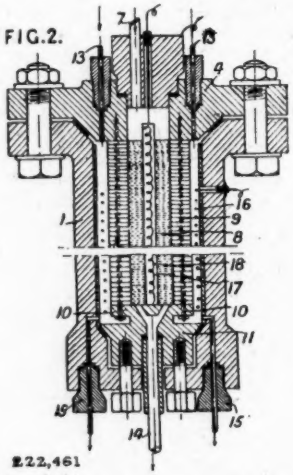


means of ammoniacal copper solution, water and alkali solution. The gas mixture produced by passing regulated quantities of air and steam through a producer is passed through a water-scrubber to a gas holder. Steam is then added and the carbon monoxide oxidised, and the product compressed to 100 atmospheres after cooling. The gas is then passed through a water-scrubber, and then through an ammoniacal copper solution to remove carbon monoxide as described in specification 220,651 (see THE CHEMICAL AGE, Vol. XI., p. 428). The gas is finally passed through liquid ammonia to purify it as described in specification 215,789 (see THE CHEMICAL AGE, Vol. XI., p. 101), and then passes into the ammonia synthesis apparatus.

222,147. The mixture for ammonia synthesis at first contains too small a proportion of nitrogen, and it is treated catalytically with steam and then with an oxygen-containing gas to adjust finally the nitrogen content. The gas mixture, after cooling and purification, is forced by a pump 2 into a preheating apparatus 47, 49, 51, 47^a, 49^a, 47^b, and then through a pipe 52 to converters 39. Steam in measured quantity is supplied through the pipe 48, and reacts with the carbon monoxide in the converters. The gas then returns through the preheating system 47^b, 44, 47^a, 45, 47 in counter-current to the incoming gas, and passes through a pipe 46 to condensers 4 and gas holder 5. Some of the steam required may be supplied by means of water forced by a pump B through the first preheater 47, and the remainder is introduced directly into the second preheater 47^a. To make up the deficiency in nitrogen, some of the original gas from the pipe 48^a is passed through a pipe 9 to the auxiliary burners 8, and air is also supplied by a blower 6 through a pipe 7 in insufficient quantity for complete combustion, as determined by analysis of the gases. Other means may be employed for adjusting the deficiency of nitrogen.

222,461. AMMONIA SYNTHESIS. Norsk Hydro-Elektrisk Kraelstofaktieselskab, 7, Solligaten, Christiania. International Convention date, September 28, 1923.

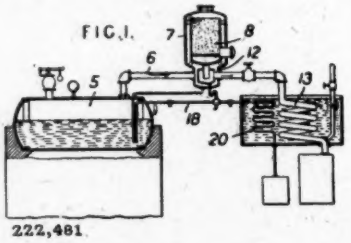
The reaction chamber for the synthesis of ammonia is formed of a series of rings 9 of conducting material such as metal, or



heat insulating material such as asbestos. The rings are held together by bolts 10, and the walls thus formed are permeable to the reaction gases. Alternatively, the walls may be formed of porous material packed into the annular space between two perforated tubes. The gas is supplied through the inlet 7, passes through the catalytic material and partly through the rings 9, and escapes through the pipes 14, 15. In starting the reaction, air is also supplied through the pipes 13, and the combustible mixture is ignited electrically to heat the catalyst to the required temperature. The reaction proceeds without further heating, and it may be necessary to cool the catalyst by fresh reaction gases admitted by the pipes 13. The initial heating may alternatively be effected by an electric resistance 17.

222,481. PURIFYING HYDROCARBONS. T. T. Gray, Elizabeth, N.J., U.S.A. International Convention date, September 26, 1923.

Cracked hydrocarbon vapour is passed around a catalyst chamber and then through the catalyst, *e.g.*, fuller's earth,



boneblack, bauxite, or kieselguhr, to convert the unsaturated compounds into liquid polymerization products. These are returned to the still or converted into lubricating oils.

Oil is distilled at 5–35 atmospheres in a still 5 and the vapour passes through a pipe 6 to a dephelgmator 7 containing a catalyst 8. The vapour passes around the catalyst to heat it, and then downwards through it to a separator 12 and con-

denser 13. The liquid polymers are returned to the still by a pipe 18, or are discharged through a cooler 20. The catalyst may be regenerated by passing some of the condensed solvent through it, and the vessel containing the catalyst may alternatively be heated by a steam jacket.

222,484. GAS MANUFACTURE. F. Caspari, Gelsenkirchen, Rhineland, Germany. International Convention date, September 27, 1923.

Fuels having a high volatile content, such as brown coal, peat, etc., are mixed with tarry substances before subjection to low temperature distillation. The gases are then free from dust, and the residue is suitable for briquetting.

222,486. ZIRCONIUM SALTS. Deutsche Gasgluhlicht-Auer-Ges., 11, Ehrenbergstrasse, Berlin (Assignees of Chemische Werke vorm. Auer Ges. Kommanditges., 11, Ehrenbergstrasse, Berlin). International Convention date, September 25, 1923.

Zirconium ore is treated with sulphuric acid, and the product dissolved in a small quantity of water and the zirconium sulphate precipitated by adding sulphuric or hydrochloric acid. The solution may alternatively be submitted to hydrolysis at 70°, and then further digested, giving a basic sulphate $ZrO_2:SO_3 = 1:0{\cdot}75$, and leaving the iron and titanium in the mother liquor. The precipitated zirconium sulphate may be converted into the basic sulphate by digesting with the mother liquor.

LATEST NOTIFICATIONS.

224,849. Manufacture of a symmetrical urea of meta-amino-benzoyl-meta-aminomethylbenzoil-l-naphthylamino-4-6-8-trisulphonate of sodium. Soc. Anon. des Etablissements Poulenc Frères, Fourneau, E., and Trèfouel, J. November 14, 1923.

224,913. Manufacture of alylk resorcinols. Sharp and Dohme, Inc. July 31, 1923.

224,921. Method for the production of alcohol. Barbet, E. A. November 17, 1923.

Specifications Accepted with Date of Application

202,970. Metal oxides, Process of and apparatus for the reduction of, with continuous regeneration of the reducing-gas employed. G. Constant and A. Bruzac. August 22, 1922.

206,498. Oxides of nitrogen, Method of producing. H. G. A. Ramsay. October 29, 1923.

210,094. Separating benzol or benzene from mixtures containing dilute alcohol, Process and apparatus for. H. Stinnes-Riebeck Montan-und Oelwerke Akt.-Ges. January 22, 1923.

210,409. Fertilisers and other materials, Process and apparatus for converting into a non-caking condition. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. January 23, 1923.

211,887. Dryer and pulveriser for the combined drying and pulverising of clays and other plastic materials. Soc. d'Exploitations des Procedes Hidoux. February 24, 1923.

212,871. Electrodes and their method of manufacture. Chile Exploration Co. March 16, 1923.

213,568. Alloyed steel and iron with chromium, manganese, molybdenum, tungsten, vanadium, and the like, Method of producing. G. Stig and E. Stig. March 27, 1923.

219,926. Cellulose esters, Process of manufacturing. Soc. de Stearinerie et Savonnerie de Lyon. July 31, 1923.

219,935. Centrifugal separator bowls, Device for introducing a carrier-liquid into. Aktiebolaget Separator. August 2, 1923.

224,305. Tar, Distillation of. Chemical Engineering and Wilton's Patent Furnace Co., Ltd., and S. M. Shadbolt. August 13, 1923.

224,359. Cellulose acetate materials, Production of black shades on. British Dyestuffs Corporation, Ltd., L. G. Lawrie, and H. Blackshaw. October 18, 1923.

224,363. Dyestuffs of the anthraquinone series. British Dyestuffs Corporation, Ltd., J. Baddiley, and W. W. Tatum. October 25, 1923.

224,376. Triarylguanidines, Manufacture of. British Dyestuffs Corporation, Ltd., C. J. T. Cronshaw, and W. J. S. Naunton. November 1, 1923.

224,431. Expelling volatile substances by means of a stream of vapour, Process of. O. Y. Imray. (Farbwerke vorm. Meister, Lucius, and Brüning.) February 19, 1924.

224,438. Alkali cyanide, Production of. J. Y. Johnson. (Badische Anilin and Soda Fabrik.) March 1, 1924.

224,468. Phosphated chalk and other substances, Process for the enrichment or other treatment of. G. Bernard. May 10, 1924.

Applications for Patents

Akt.-Ges. für Anilin-Fabrikation. Process for dyeing furs, etc. 28,018. November 22. (Germany, January 23.)

Atlantic Chemical Co., Ltd., and Fleming, E. L. Manufacture of concentrated borate from crude borate of lime. 28,021, 28,022. November 22.

Auld, S. J. M., and Dunstan, A. E. Treatment of hydrocarbons. 27,956. November 21.

Baddiley, J., and British Dyestuffs Corporation, Ltd. Dyeing acetyl cellulose. 28,013. November 22.

Bailey, H. Production of helium from radio-active ores, etc. 27,616. November 19.

Barbet, E. A. Production of alcohol. 27,473. November 17. (France, November 17, 1923.)

Barrett Co. Manufacture of polymerised naphthas. 27,612. November 18. (United States, November 23, 1923.)

Best, R. B. Emulsifying or mixing apparatus. 27,429. November 17.

Blagden, J. W., and Howard and Sons, Ltd. Manufacture of thymol. 27,707. November 19.

Bollmann, H. Method for decolorising fats, etc. 27,842. November 20. (Germany, March 24.)

British Cyanides Co., Ltd. Manufacture of artificial resins. 28,023. November 22.

British Glues and Chemicals, Ltd., and Drew, R. B. Extraction of fat from bones. 27,714. November 19.

Courtaulds, Ltd., and Lunge, E. Pumps, etc. 27,824, 27,825, 27,826, 27,827, 27,832. November 20.

Courtaulds, Ltd., and Lunge, E. Apparatus for manufacture of artificial silk. 27,828, 27,829. November 20.

Courtaulds, Ltd., and Lunge, E. Filters. 27,830. November 20.

Courtaulds, Ltd., and Lunge, E. Air-vessels for securing regular flow from reciprocating pumps, etc. 27,831. November 20.

Cowles, A. H. Production of fertilisers. 27,947. November 21.

Divine, R. E. Manufacture of soap. 27,610. November 18.

Farbwerke vorm. Meister, Lucius, and Brüning. Device for feeding salt-cake furnace. 28,019. November 22. (Germany, November 26, 1923.)

Hernandez, L. de, and Wade, H. Apparatus for distillation of ores. 27,710. November 19.

International Nickel Co., and Wade, H. Manufacture of alloys. 27,917. November 21.

Lilienfeld, L. Manufacture of cellulose compounds. 27,837. November 20. (Austria, October 10.)

Mills, W. G., and Packards and J. Fison (Thetford), Ltd. Chambers for manufacture of sulphuric acid. 27,449, 27,450. November 17.

Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Process of separating a mixture of hafnium and zirconium compounds. 27,836. November 20. (Holland, December 12, 1923.)

Rossiter, E. C. Manufacture of artificial resins. 28,023. November 22.

Sandoz Chemical Co., Ltd. Dyeing cotton materials. 27,454. November 17.

Sedgwick, A. S. E. Device for spraying insecticides, etc. 27,811. November 20.

Soc. Chemique des Usines du Rhône. Manufacture of arsenates of the alkaline-earth metals. 27,566. November 18. (France, January 3.)

Soc. Chimique des Usines du Rhône. Process for manufacture of malonic-acid esters. 27,567. November 18. (France, February 7.)

Soc. of Chemical Industry in Basle. Manufacture of indigoid dyestuffs. 28,017. November 22. (Switzerland, November 30, 1923.)

Suida, H. Process for obtaining gases rich in ethylene. 28,027. November 22. (Austria, November 30, 1923.)

Patents in Russia

THE attention of inventors is drawn to the new patent laws under which inventions can be protected and patents obtained for them in Russia. These laws follow the main lines of the British patent laws, but differ from them in several important particulars.

As these laws and the procedure to be adopted under them are somewhat intricate, any inventor desirous of protecting his invention in Russia should apply to the Commercial Information Department of the Russian Trade Delegation, who will supply an English translation of the laws, together with any further information.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing those firms' independent and impartial opinions.

London, November 27, 1924.

THE outlook in the chemical trade continues brighter. The steady increase in the prosperity of the industries upon which the chemical trade depends portends, we hope, a brighter year for all concerned. With few exceptions home trade prices are very firm. Export inquiry is fair.

General Chemicals

ACETONE is in fair demand at £92 to £93 per ton.

ACID ACETIC.—The market is improving, several weak holders and other disturbing elements having disappeared. 80% Technical £41 to £42 per ton, and 80% Pure £42 10s. to £43 10s. per ton.

ACID CITRIC is lifeless, price nominally 1s. 3d. per lb.

ACID FORMIC is in good demand with 85% quoted at £53 per ton ex wharf.

ACID LACTIC is in good demand at £43 per ton for 50% by weight.

ACID OXALIC.—The improvement in the continental situation indicated last week has been maintained and higher prices are expected on this side.

ACID TARTARIC is in the doldrums, as is usually the case at this time of the year. Price nominally about 1s. per lb. with secondhand parcels offering cheaper.

ALUMINA SULPHATE.—Unchanged at £7 5s. per ton for 17%–18%.

ARSENIC is rather firmer, although the demand continues slow. Cornish is about £43 per ton, with Japanese higher at about £32 per ton.

BARIUM CHLORIDE is in better demand at £12 to £12 10s. per ton.

COPPER SULPHATE.—Unchanged.

CREAM OF TARTAR is in active demand, price £80 per ton, which can be shaded for quantities.

FORMALDEHYDE.—It is generally recognised that makers are selling at a loss owing to the absence of demand. It would appear that the price has touched bottom.

EPSOM SALTS are firmer at £4 5s. to £4 10s. per ton.

LEAD ACETATE is rather dearer at £46 10s. to £47 for white, and £43 to £44 for brown.

LEAD NITRATE has only been in slow demand. Price about £43 10s. per ton.

LIME ACETATE.—Astonishing quantities have been sold during the last week or two. Price is unchanged but very firm.

MAGNESIUM CHLORIDE.—Unchanged.

METHYL ALCOHOL.—Rather more business is reported. For small quantities the price is £60 to £62, but a lower price is obtainable for larger lots.

POTASSIUM CAUSTIC AND CARBONATE.—Unchanged.

POTASSIUM BICHROMATE is only in small demand at about 5d. per lb.

POTASSIUM PERMANGANATE.—In slow demand at about 7d. per lb.

POTASSIUM PRUSSIATE is very firm and scarce, price about 7½d. per lb.

SODIUM ACETATE is in good demand, price £23 10s. per ton.

SODIUM BICHROMATE is in fair demand at 4d. per lb.

SODIUM HYPOSULPHITE is in good demand at £9 10s. per ton for commercial.

SODIUM NITRITE is a steady market, at about £25 per ton.

SODIUM PRUSSIATE is much healthier, price to-day 4¼d. per lb. to 4⅜d. per lb.

SODIUM SULPHIDE.—Unchanged.

Coal Tar Products

The improved tone of the market in coal tar products continues, and all prices are firm.

90% BENZOL continues to be scarce, and is worth 1s. 8d. per gallon on rails.

PURE BENZOL is quoted at 2s. per gallon on rails.

CREOSOTE OIL is steady, with a fair inquiry, and its value is from 5¼d. to 5½d. per gallon on rails in the North, while the price in the South is from 6d. to 6¼d. per gallon.

CRESYLIC ACID remains unchanged from last week, the Pale quality 97/99% being worth 1s. 11d. per gallon on rails, while the Dark quality 95/97% is quoted at 1s. 7d. to 1s. 8d. per gallon.

SOLVENT NAPHTHA remains firm at 1s. 3d. to 1s. 4d. per gallon on rails.

HEAVY NAPHTHA shows no change at 1s. to 1s. 1d. per gallon on rails.

NAPHTHALENES are also unchanged, the low qualities being worth from £3 10s. to £4 10s. per ton, while of the higher grades 76/78 quality is quoted at £6 to £6 10s. per ton, and 74/76 quality at £5 10s. to £6 per ton.

PITCH remains firm although continental buyers do not appear to be anxious to follow the recent advance in price. To-day's values are :—50s. to 55s. f.o.b. London ; 50s. to 52s. 6d. f.o.b. East and West coast ports.

Nitrogen Products Market

EXPORT.—During the past week the market has remained quiet, and prices have been unchanged at £13 15s. per ton f.o.b. for prompt delivery and £14 to £14 10s. per ton f.o.b. for forward delivery.

Inquiries continue to come in from the United States, but up to the present the British producers have made no sales. The fact, however, that the U.S.A. is importing will tend to reduce competition in export markets with this country, and will tend to make the market firmer. If American imports reach a considerable total, there is no doubt that prices will be raised.

HOME TRADE.—The producers are selling freely for delivery up to December 31, and it is anticipated that prices will shortly be announced for the period January-May. Home bookings continue to be satisfactory.

NITRATE OF SODA.—The Nitrate of Soda market is unchanged ; prices still range from £11 15s. to £11 18s. per ton prompt and from £11 18s. to £12 4s. per ton for later arrivals. Most of the business done in nitrate of soda during the last week or two has been for re-sale. There is no change indicated in the consumption either in Europe or U.S.A.

The "Ventex" Air Filter

THE problem of efficient air filtration is of considerable importance in many industrial processes, and the old type of felt filter is being displaced by more modern devices. A recently introduced type is the "Ventex," made by Ozonair, Ltd., of 96, Victoria Street, London, S.W.1. The filter consists of a number of corrugated plates arranged horizontally in a frame, and the whole being dipped in a viscous fluid ; when air is passed through it the dust particles are trapped by the fluid and retained. If the filter is used in connection with a ventilation system a depth of one frame (4 in.) is sufficient, and a single unit can pass about 600 cubic ft. of air per minute. Under these conditions the resistance of the filter is 0·14 in water gauge, and the frames require cleaning about every three months, this being done in a bath of caustic soda. Naturally, the figures given will depend to some extent on the quantity of foreign matter being removed.

New Radioactive Substance

A FRENCH correspondent, writing to *Industrial and Engineering Chemistry*, states : I have previously pointed out the discovery by M. Loisel of a new radioactive substance, hémilium, which he has detected in the waters of the Bangnoles de l'Orne. On examination of the granite of this region, M. Loisel has found this same radioactive product, the curve of destruction of which is quite different from that of radon or thoron. The curve obtained with hémilium, after periods of accumulation varying between 2 and 65 days, is at a minimum at the end of 15 minutes and at a maximum at the end of 28 minutes, after that blending in with the curve of radon. It appears that a new category for a radioactive body has been found. It is desirable that analogous research be carried out in other regions of the globe, on different waters and different rocks. It should probably be first applied to granites similar in geologic formation to those studied by M. Loisel.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at sellers' works.

General Heavy Chemicals

Acid Acetic 40% Tech.—£23 10s. per ton.
Acid Boric, Commercial.—Crystal, £45 per ton. Powder, £47 per ton
Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d., according to purity, strength and locality.
Acid Nitric 80° Tw.—£21 10s. to £27 per ton, makers' works according to district and quality.
Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.
Bleaching Powder.—Spot, £11 d/d.; Contract, £10 d/d. 4 ton lots
Bisulphite of Lime.—£7 10s. per ton, packages extra.
Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)
Calcium Chloride.—£5 17s. 6d. per ton d/d.
Copper Sulphate.—£25 per ton.
Methylated Spirit 64 O.P.—Industrial, 2s. 7d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.
Nickel Sulphate.—£38 per ton d/d. Normal business.
Nickel Ammonia Sulphate.—£38 per ton d/d. Normal business
Potash Caustic.—£30 to £33 per ton.
Potassium Bichromate.—5½d. per lb.
Potassium Chlorate.—3d. to 4d. per lb.
Salammoniac.—£32 per ton d/d.
Salt Cake.—£3 10s. per ton d/d.
Soda Caustic, Solid.—Spot lots delivered, £16 7s. 6d. to £19 7s. 6d. per ton, according to strength; 20s. less for contracts.
Soda Crystals.—£5 5s. to £5 10s. per ton ex railway depots or ports.
Sodium Acetate 97/98%.—£24 per ton.
Sodium Bicarbonate.—£10 10s. per ton carr. paid.
Sodium Bichromate.—4½d. per lb.
Sodium Bisulphite Powder 60/62%.—£17 to £18 per ton, according to quantity, f.o.b., 1-cwt. iron drums included.
Sodium Chlorate.—3d. per lb.
Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool. Nominal.
Sodium Nitrite 100% basis.—£27 per ton d/d.
Sodium Sulphide conc. 60/65.—About £14 10s. per ton d/d.
Sodium Sulphide Crystals.—£9 per ton d/d.
Sodium Sulphite, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—6½d. per lb. Crude 60's, 1s. 8d. to 1s. 10d. per gall. Market better.
Acid Cresylic 97/99.—2s. per gall. Not much business. Pale 95%, 1s. 8d. to 1s. 11d. per gall. More inquiry. Dark, 1s. 7d. to 1s 9d. per gall. Market dull.
Anthracene Paste 40%.—4d. per unit per cwt. Nominal price. No business.
Anthracene Oil, Strained.—6½d. to 7½d. per gall. Small demand. Unstrained, 6d. to 6½d. per gall.
Benzol.—Crude 65's.—7½d. to 9d. per gall., ex works in tank wagons. Standard Motor, 1s. 1½d. to 1s. 3d. per gall., ex works in tank wagons. Pure, 1s. 5½d. to 1s. 7d. per gall., ex works in tank wagons.
Toluol.—90%, 1s. 5½d. to 1s. 7d. per gall. More inquiry. Pure, 1s. 7d. to 1s. 9d. per gall. Small demand for home consumption.
Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.
Creosote.—Cresylic, 20/24%, 8d. to 8½d. per gall. Little demand. Middle Oil, Heavy, Standard specification, 5½d. to 6½d. per gall., according to quality and district. Market firmer.
Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 1s. 3d. to 1s. 4d. per gall. Demand good. Higher prices probable. Solvent 90/190, 11½d. to 1s. 1d. per gall. Demand maintained.
Naphthalene Crude.—Demand rather better. Cheaper in Yorkshire than in Lancashire. Drained Creosote Salts, £3 to £5 per ton. Demand slightly better. Whizzed or hot pressed, £6 to £9 per ton. Demand very poor.
Naphthalene.—Crystals and Flaked, £12 to £15 per ton, according to districts.
Pitch.—Medium soft, 45s. to 60s. per ton, according to district. Plenty of inquiry. Prospects brighter.
Pyridine.—90/160, 18s. 6d. to 19s. per gall. Market quiet. Heavy, 11s. 6d. to 12s. Steady.

Intermediates and Dyes

Business in dyestuffs has been maintained but without further improvement. Prices remain unaltered.

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.
Acid H.—3s. 10d. per lb. 100% basis d/d.
Acid Naphthionic.—2s. 4d. per lb. 100% basis d/d
Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.
Acid Salicylic, technical.—1s. 1d. per lb. Improved demand.
Acid Sulphanilic.—9d. per lb. 100% basis d/d.
Aluminium Chloride, anhydrous.—1s. per lb. d/d.
Aniline Oil.—8d. per lb. naked at works.
Aniline Salts.—8½d. per lb. naked at works.
Antimony Pentachloride.—1s. per lb. d/d.
Benzidine Base.—3s. 10d. per lb. 100% basis d/d.
Benzyl Chloride 95%.—1s. 1d. per lb.
p-Chlorphenol.—4s. 3d. per lb. d/d.
p-Chloraniline.—3s. per lb. 100% basis.
o-Cresol 19/31° C.—4½d. per lb. Rather quiet.
m-Cresol 98/100%.—2s. 1d. to 2s. 3d. per lb. Demand moderate
p-Cresol 32/34° C.—2s. 1d. to 2s. 3d. per lb. Demand moderate
Dichloraniline.—2s. 3d. to 3s. per lb.
Dichloraniline S. Acid.—2s. 6d. per lb. 100% basis.
p-Dichlorbenzol.—£85 per ton.
Diethylaniline.—4s. 3d. per lb. d/d., packages extra, returnable
Dimethylaniline.—2s. 2½d. per lb. d/d. Drums extra.
Dinitrobenzene.—9d. to 10d. per lb. naked at works.
Dinitrochlorbenzol.—£84 10s. per ton d/d.
Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works 66/68° C. 1s. 2d. per lb. naked at works.
Diphenylaniline.—2s. 10d. per lb. d/d.
G. Salt.—2s. 3d. per lb. 100% basis d/d.
Monochlorbenzol.—£63 per ton
a-Naphthol.—2s. 4d. per lb. d/d.
B-Naphthol.—1s. per lb. d/d.
a-Naphthylamine.—1s. 3½d. per lb. d/d.
B-Naphthylamine.—4s. per lb. d/d.
m-Nitraniline.—4s. 2½d. per lb. d/d.
p-Nitraniline.—2s. 2½d. per lb. d/d.
Nitrobenzene.—5½d. to 5¾d. per lb. naked at works
o-Nitrochlorbenzol.—2s. per lb. 100% basis d/d.
Nitronapthalene.—10d. per lb. d/d.
p-Nitrophenol.—1s. 9d. per lb. 100% basis d/d.
p-Nitro-*o*-amido-phenol.—4s. 6d. per lb. 100% basis.
m-Phenylene Diamine.—4s. per lb. d/d.
p-Phenylene Diamine.—10s. 2d. per lb. 100% basis d/d.
R. Salt.—2s. 4d. per lb. 100% basis d/d.
Sodium Naphthionate.—2s. 2d. per lb. 100% basis d/d.
o-Toluidine.—10d. per lb.
p-Toluidine.—2s. 10d. per lb. naked at works.
m-Toluylene Diamine.—4s. per lb. d/d.

Wood Distillation Products

There is a general feeling that the fall in price of acetates during the last few weeks has reached its limit. The tendency is now to stiffen again.

Acetate of Lime.—Brown £11 10s. per ton d/d. and upward. Grey, £14 per ton. Liquor, 9d. per gall 32° Tw.
Charcoal.—£7 5s. to £9 per ton, according to grade and locality. Demand quiet, but price steady.
Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw
Red Liquor.—10d. to 1s. per gall. 14/15° Tw.
Wood Creosote.—2s. 9d. per gall. Unrefined.
Wood Naphtha, Miscible.—4s. 9d. per gall. 60% O.P. Solvent, 5s. per gall. 40% O.P. Firmer.
Wood Tar.—£4 to £5 per ton. Very quiet.
Brown Sugar of Lead.—£41 per ton. Steady market.

Rubber Chemicals

Antimony Sulphide.—Golden, 6½d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.
Arsenic Sulphide, Yellow.—1s. 11d. per lb.
Barytes.—£3 10s. to £6 15s. per ton, according to quality.
Cadmium Sulphide.—3s. 9d. to 4s. per lb., according to quantity.
Carbon Bisulphide.—£30 to £33 per ton, according to quantity. Again dearer.
Carbon Black.—7d. to 7½d. per lb., ex-wharf. Dearer.
Carbon Tetrachloride.—£60 to £65 per ton, according to quantity, drums extra. Again dearer.
Chromium Oxide, Green.—1s. 3d. per lb.
Indiarubber Substitutes, White and Dark.—5d. to 9½d. per lb. Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.
Lamp Black.—£48 per ton, barrels free.
Lead Hyposulphite.—7½d. per lb.
Lithopone, 30%.—£22 10s. per ton.
Mineral Rubber "Rubpron."—£16 5s. per ton f.o.r. London.

Sulphur.—£10 to £12 per ton, according to quality
Sulphur Chloride.—4d. per lb., carboys extra. Dearer.
Sulphur Precip. B.P.—£50 to £65 per ton.
Thiocarbanilide.—2s. 6d. per lb.
Vermilion, Pale or Deep.—5s. 1d. per lb. Dearer.
Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£45 per ton ex wharf London in glass containers.
Acid, Acetyl Salicylic.—3s 1d. to 3s. 3d. per lb., according to quantity. Sales steady. Price firm.
Acid, Benzoic B.P.—2s. 6d. per lb. Cheaper.
Acid, Boric B.P.—Crystal £51 per ton, Powder £55 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 4d. per lb., less 5% for ton lots. Market still weak.
Acid, Gallic.—2s. 11d. per lb. for pure crystal, in cwt. lots.
Acid, Pyrogallic, Crystals.—6s. 9d. per lb. for 1 cwt. lots. Market firm. Increasing demand.
Acid, Salicylic.—1s. 6d. to 1s. 7d. per lb., according to quantity.
Acid, Tannic B.P.—2s. 10d. per lb. Forward quotations higher. Spot value likely to increase.
Acid, Tartaric.—1s. per lb., less 5%.
Amidol.—9s. per lb. d/d.
Acetanilide.—1s. 10d. to 2s. per lb. More inquiry.
Amidopyrin.—15s. per lb. for spot stocks.
Ammonium Benzoate.—3s. 3d. to 3s. 6d. per lb., according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. 6d. per oz. for English make.
Barbitone.—13s. 9d. per lb. Slightly lower. Quiet steady demand.
Benzonaphthol.—5s. 3d. per lb. Small inquiry.
Bismuth Salts.—Prices reduced by about 1s. 3d. to 2s. 3d. per lb. on account of the fall in the price of the metal.
Bismuth Carbonate.—8s. 6d. to 10s. 6d. per lb.
Bismuth Citrate.—8s. 6d. to 10s. 6d. per lb.
Bismuth Salicylate.—8s. 0d. to 10s. 0d. per lb.
Bismuth Subnitrate.—7s. 7d. to 9s. 7d. per lb.
Prices reduced owing to fall in price of metal. Prices according to quantity.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 11d. per lb.; sodium, 2s. per lb.; ammonium, 2s. 1d. per lb. Very scarce and dear. Prices uncertain.
Calcium Lactate—1s. 7d. to 2s., according to quantity. Fair demand and steady market.
Chloral Hydrate.—4s. per lb. Slightly easier.
Chloroform.—2s. 6d. per lb. for cwt. lots. Price advanced by 6d. per lb.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£48 to £49 per ton, in barrels ex wharf London. Supplies exceed demand.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—9s. 6d. per lb.
Hexamine.—3s. per lb. For bold crystal. Powder slightly less.
Homatropine Hydrobromide.—25s. to 30s. per oz
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb., for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—1s. 11d. to 2s. 3d. per lb. Prices recently reduced.
Magnesium Carbonate.—Light Commercial, £36 per ton net.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £25 per ton, less 2½%; Heavy Pure, 1s. 6d. to 2s. per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 57s. per lb., for December deliveries. No spot deliveries available. Synthetic, 26s. to 35s. per lb. Increasing demand.
Mercurials.—Market very quiet. Red oxide, 5s. 2d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 5d. to 3s. 7d. per lb.; white precipitate, 4s. 6d. to 4s. 8d. per lb.; Calomel, 3s. 10d. to 4s. per lb.
Methyl Salicylate.—1s. 9d. to 2s per lb.
Methyl Sulphonel.—22s. 6d. per lb. Slightly weaker.
Metol.—11s. per lb. British make.
Morphine and Salts.—Reduced by 1s. to 1s. 3d. per oz.
Paraformaldehyde.—2s. 8d. for B.P. Quality.
Paraldehyde.—1s 2d. to 1s. 6d. per lb., in free bottles and cases.
Phenacetin.—5s. 6d. per lb.
Phenazone.—6s. 10d. per lb.
Phenolphthalein.—5s. 6d. per lb. For cwt. lots.
Potassium Bitartrate 99/100% (Cream of Tartar).—84s. per cwt. less 2½% for ton lots.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb. Dearer.
Potassium Ferricyanide.—1s. 9d. per lb. Quiet.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Good steady demand.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., carriage paid; commercial, 8d. to 8½d. per lb., carriage paid. Forward prices higher.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Good market.
Resorcin.—5s. 3d. per lb.
Saccharin.—63s. per lb. in 50-lb lots
Salol.—3s. 9d. per lb., for cwt. lots.
Silver Proteinate.—9s. per lb. for satisfactory product light in colour.
Sodium Benzoate, B.P.—2s. 6d. per lb. Ample supplies of good quality available.
Sodium Citrate, B.P.C., 1923.—1s. 11d. to 2s. 2d. per lb., according to quantity.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton, according to quantity, d/d. consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb. Less for quantity.
Sodium Potassium Tartrate (Rochelle Salt).—75s. to 82s. 6d. per cwt., according to quantity. Market steady, good demand.
Sodium Salicylate.—Powder, 2s. 1d. to 2s. 3d. per lb. Crystal, 2s. 2d. to 2s. 4d. per lb Flake, 2s. 6d. per lb. Fair demand.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb., according to quantity.
Sodium Sulphite, anhydrous, £27 10s. per ton, minimum 5 ton lots, according to quantity, 1 cwt. kegs included.
Sulphonal.—14s. 6d. per lb. Little demand.
Thymol.—18s. per lb. Firmer market.

Perfumery Chemicals

Acetophenone.—11s. 3d. per lb. Cheaper
Aubepine.—15s. per lb. Cheaper.
Amyl Acetate.—3s. per lb.
Amyl Butyrate.—6s. 6d. per lb.
Amyl Salicylate.—3s. 3d. per lb.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 9d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 9d. per lb.
Benzaldehyde free from Chlorine.—3s. 6d. per lb.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—18s. 6d. per lb. Cheaper.
Coumarin.—18s. 9d. per lb.
Citronellol.—17s. per lb.
Citral.—8s. per lb.
Ethyl Cinnamate.—12s. 6d. per lb.
Ethyl Phthalate.—3s. per lb. Cheaper.
Eugenol.—10s. 6d. per lb. Dearer.
Geraniol (Palmarosa).—33s. 6d. per lb.
Geraniol.—12s. 6d to 20s. per lb. Dearer.
Heliotropine.—6s. 9d. per lb.
Iso Eugenol.—16s. per lb.
Linalol ex Bois de Rose.—26s. per lb.
Linalyl Acetate.—26s. per lb.
Methyl Anthranilate.—10s. per lb. Dearer.
Methyl Benzoate.—5s. per lb.
Musk Ambrette.—50s. per lb.
Musk Xylol.—14s. per lb. Dearer,
Nerolin.—4s. 6d. per lb. Cheaper.
Phenyl Ethyl Acetate.—15s. 6d. per lb. Dearer.
Phenyl Ethyl Alcohol.—16s. per lb.
Rhodinol.—55s. per lb.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 4d. per lb.
Vanillin.—25s. 6d. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—2s. 10d. per lb.
Bergamot Oil.—16s. per lb.
Bourbon Geranium Oil.—35s. per lb.
Camphor Oil.—65s. per cwt.
Cananga Oil, Java.—11s. per lb.
Cinnamon Oil, Leaf.—6½d. per oz.
Cassia Oil, 80/85%.—9s. 9d. per lb.
Citronella Oil.—Java, 85/90%, 6s. 10½d. per lb. Ceylon, 3s. 8d. per lb.
Clove Oil.—8s. 3d. per lb. Dearer.
Eucalyptus Oil, 70/75%.—2s. 3d. per lb.
Lavender Oil.—French 38/40% Esters, 35s. per lb. Dearer.
Lemon Oil.—3s. per lb.
Lemongrass Oil.—5s. per lb.
Orange Oil, Sweet.—11s. per lb.
Otto of Rose Oil.—Bulgarian, 40s. per oz. Anatolian, 18s. per oz.
Palma Rosa Oil.—16s. 6d. per lb.
Peppermint Oil.—Wayne County, 35s. per lb. Japanese, 22s. 6d. per lb. Nominal.
Petitgrain Oil.—9s. 9d. per lb. Dearer.
Sandal Wood Oil.—Mysore, 26s. 7d. per lb. Australian, 18s. 6d. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, November 27, 1924.

THE heavy chemical market has shown little activity during the past week, and although a fair amount of inquiry is going around it is in nearly all instances for small quantities.

Prices both for home and continental products remain unaltered, with one notable exception, *viz.*, arsenic, which has, within the past week or two, fallen about £4 per ton.

ACID ACETIC.—Glacial 98/100%, £57 to £68 per ton; 80% pure, £45 to £47 per ton; 80% technical, £44 to £46 per ton. All packed in casks delivered c.i.f. U.K. ports, duty free.

ACID BORACIC.—Remains unchanged. Crystal or granulated £45 per ton, powdered £47 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Unchanged at about 5¼d. per lb., delivered.

ACID CITRIC, B.P. CRYSTALS.—Nominally 1s. 3½d. per lb., less 5% ex store, but could probably be obtained for less. Offered for prompt shipment at 1s. 3d. per lb., less 5%, ex wharf.

ACID FORMIC, 85%.—On offer at £50 per ton, c.i.f. U.K. ports duty free. Spot lots quoted £53 to £54 per ton, ex store.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex-works.

ACID NITRIC 80°.—£23 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—Unchanged at about 3¾d. per lb., ex store. Offered for prompt shipment from the continent at 3½d. per lb., ex wharf.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Quoted 11¾d. per lb., less 5%, ex store. Offered for prompt shipment from the continent at about 11¼d. per lb. less 5%, ex wharf.

ALUMINA SULPHATE, 17/18% IRON FREE.—On offer at £6 15s. per ton c.i.f. U.K. port, prompt shipment. Spot lots available at about £7 10s. per ton, ex store.

ALUM.—Potash chrome alum, 15%, offered from the continent at about £18 15s. per ton, c.i.f. U.K. port. Lump potash alum quoted £9 15s. per ton, ex store. Offered from the continent at about £9 per ton, c.i.f. U.K. port.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 6d. per lb., ex station. Containers extra and returnable, with possible slight reduction for large quantities.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton; packed in 5 cwt. casks delivered U.K. port.

AMMONIA LIQUID 880.—In steady demand. Unchanged at 2½d. to 3d. per lb. delivered, according to quantity, containers extra.

AMMONIA MURIATE.—Grey galvanizers' crystals of English manufacture quoted £30 per ton in casks, £29 per ton in bags, carriage paid stations. On offer from the continent at about £27 per ton, c.i.f. U.K. port. Fine white crystals offered from the continent at £22 10s. per ton, c.i.f. U.K. port.

ARSENIC, WHITE POWDERED.—Further reduced in price. Offered for early delivery at about £36 10s. per ton, ex wharf. Spot lots available at about £40 per ton, ex store. Foreign arsenic quoted £33 per ton, f.o.b., U.K. port.

BARIUM CARBONATE, 98/100%.—Now quoted £9 5s. per ton, c.i.f., U.K. port.

BARIUM CHLORIDE, 98/100%.—Inclined to be lower. Now quoted £12 10s. per ton, ex store. Offered from the continent at about £11 7s. 6d. per ton, c.i.f., U.K. port.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f., U.K. port.

BLEACHING POWDER.—Spot lots, £11 per ton, ex station, contracts 20s. per ton less.

BORAX.—Granulated, £24 10s. per ton; crystals, £26 per ton; powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton, ex station. Continental material on offer at about £5 per ton, ex store.

COPPERAS, GREEN.—Unchanged at about £3 5s. per ton, ex works, packed in casks, free.

COPPER SULPHATE.—English material unchanged at about £25 per ton, f.o.b., U.K. port for export. Continental material available at about £23 10s. per ton, ex quay.

FORMALDEHYDE 40%.—Nominally £49 per ton, ex store, but could probably be obtained for less.

GLAUBER SALTS.—English material unchanged at £4 per ton, ex store or station. Fine white crystals on offer from the continent at about £3 per ton, c.i.f. U.K. port. Large crystals, 17s. 6d. per ton extra.

LEAD, RED.—Now quoted £44 10s. per ton, ex store, spot delivery, for imported material.

LEAD, WHITE.—On offer at about £46 per ton, ex store.

LEAD ACETATE.—Spot lots available at about £46 5s. per ton, ex store. Offered for early delivery at £46 per ton, ex station. Brown quoted £40 10s. per ton, c.i.f. U.K. port.

MAGNESITE, CALCINED.—Unchanged at about £7 17s. 6d. per ton, ex station, prompt delivery. Hard burnt quality quoted £4 15s. per ton, ex station. Finer quality of continental manufacture quoted £7 15s. per ton, c.i.f. U.K. port.

MAGNESIUM CHLORIDE.—Offered from the continent at £5 2s. 6d. per ton, c.i.f. U.K. port.

POTASH CAUSTIC, 88/92%.—Spot material available at about £31 15s. per ton, ex store. Offered for prompt shipment from the continent at about £31 per ton, c.i.f. U.K. port.

POTASSIUM BICHROMATE.—Spot price unchanged at 5½d. per lb. delivered. Makers advise reduction in price of ½d. per lb. from January 1 next, and allow this concession of ½d. per lb. on undelivered portions of contracts up to that date.

POTASSIUM CARBONATE 96/98%.—Offered from the continent at £22 15s. per ton, c.i.f. U.K. port, prompt shipment. Spot lots quoted £24 10s. per ton, ex store.

POTASSIUM CHLORATE.—Spot material unchanged at about 2¾d. per lb. ex wharf On offer for prompt shipment from the continent at 2½d. per lb. c.i.f. U.K. port.

POTASSIUM NITRATE, SALTPETRE.—Quoted £26 per ton c.i.f. U.K. port, prompt shipment from the continent. Spot lots on offer at £28 15s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 8d. per lb., ex store, spot delivery. Offered for prompt shipment from the continent at about 7½d. per lb., ex wharf.

POTASSIUM PRUSSIATE, YELLOW.—Quoted 7d. per lb., ex store, offered for early delivery at slightly less, ex wharf.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d per ton; 98/99%, powdered, £22 15s. per ton. All ex station spot delivery, contracts 20s. per ton less.

SODIUM ACETATE.—Spot lots now quoted £23 10s. per ton, ex store. On offer from the continent at about £22 per ton, c.i.f. U.K. port.

SODIUM BICARBONATE.—Refined recrystallised quality £10 10s. per ton, ex quay or station; M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4¼d. per lb., delivered. Makers advise reduction of ½d. per lb. as from January 1 next, allowing concession of ½d. per lb. on undelivered portions of contracts up to that date.

SODIUM CARBONATE, SODA CRYSTALS.—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality £1 7s. 6d. per ton more. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton, ex station. Continental quoted £8 10s. per ton, c.i.f. U.K, port. Spot lots available at about £9 15s. per ton, ex store. Pea crystals of English manufacture unchanged at £13 15s. per ton, ex station.

SODIUM NITRATE.—Ordinary quality quoted £13 17s. 6d. per ton, ex store. 96/98% refined quality, 7s. 6d. per ton extra.

SODIUM NITRITE 100%.—Unchanged at about £26 per ton, ex store.

SODIUM PRUSSIATE, YELLOW.—Unchanged at 4d. per lb., ex store, spot delivery, moderate inquiry. Offered from the continent at about 3¾d. per lb., c.i.f. U.K. port.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption £3 10s. per ton, f.o.r. works. Good inquiry for export.

SODIUM SULPHIDE.—60/65% solid of English manufacture £14 15s. per ton, ex station; broken £1 per ton more; flake £2 per ton more. 60/62% solid of continental manufacture quoted £12 5s. per ton, c.i.f. U.K. port; broken £1 per ton more. 31/34% crystals of English manufacture £9 2s. 6d. per ton, ex station. 30/32% crystals of continental manufacture quoted £8 10s. per ton, c.i.f. U.K. port.

SULPHUR.—Flowers, £9 10s. per ton; roll, £8 10s. per ton; rock, £8 7s. 6d per ton; ground, £8 5s. per ton, ex store, prices nominal.

ZINC CHLORIDE.—96/98% of continental manufacture quoted £23 per ton, c.i.f. U.K. port. English material for export on offer at about £25 to £26 per ton, f.o.b. U.K. port.

ZINC SULPHATE.—Unchanged at about £12 15s. per ton, ex store, spot delivery.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ANILINE OIL.—Export inquiries. Price, 8¾d. per lb., f.o.b., drums included.

BENZIDINE BASE.—Considerable export inquiry. Price, 3s. 8d. per lb., 100% basis.

GAMMA ACID.—Good export inquiry. Price, 9s. per lb., 100% basis f.o.b.
H ACID.—Good export inquiry. Price, 3s. 6d. per lb., 100% basis.
DIMETHYLANILINE.—Some export inquiries. Price, 2s. 3d. per lb., f.o.b., drums included.
MONO NITRO NAPHTHALENE.—Small home demand. Price, 10d. per lb. delivered.
META PHENYLENE DIAMINE.—Some export inquiry. Price, 4s. per lb.
META TOLUYLENE DIAMINE.—Export inquiry. Price, 3s. 9d. per lb. f.o.b.
NEVILLE AND WINTHER ACID.—Some export inquiry. Price, 5s. 11d. per lb., 100% basis.
PARANITRANILINE.—Good export inquiries. Price, 2s. 1½d. per lb. f.o.b.
XYLIDINE.—Some home inquiries. Price, 2s. per lb. delivered.

The Manchester Chemical Market

(FROM OUR CORRESPONDENT.)

Manchester, November 27, 1924.

A QUIETLY steady demand for heavy chemicals on the Manchester market is being experienced, the volume of business being about up to the level of the past few weeks. There is a prospect of a further improvement in view of the decision of the American section of the cotton textile industry this week to make another increase in the number of working hours, starting from next Monday. In the meantime, values, with a few exceptions, are fairly steady all round, and plenty of inquiry is reported on forward account.

Heavy Chemicals

Soda crystals are in moderate request with values unchanged at £5 5s. per ton. Bichromate of soda is in fair inquiry for delivery over next year at last week's reduced price of 4d. per lb. Both saltcake and glauber salts are still quoted at £3 10s. per ton, although business continues on very quiet lines. Prussiate of soda is steady and in moderate inquiry at 4d. per lb. Hyposulphite of soda keeps quiet with values about maintained at £13 15s. to £14 per ton for photographic crystals, and £9 5s. for commercial. Phosphate of soda attracts small attention at round £13 per ton. Both home and foreign inquiry for caustic soda keeps up and values are steady at from £16 17s. 6d. per ton for 60 per cent. material to £19 7s. 6d. for 76-77 per cent. Alkali is likewise a rather brisk section at about £6 15s. per ton. Bicarbonate of soda is in quietly steady demand at £10 10s. per ton. Bleaching powder is steady, and meets with a somewhat improved inquiry at £10 per ton. Sodium sulphide attracts a moderate amount of attention and prices are maintained at £14 10s. per ton for 60-65 per cent. concentrated solid and £9 5s. for crystals. Chlorate of soda is unchanged either in position or value at round 2½d. per lb. Acetate of soda is fairly steady at £22 10s. per ton, but the demand is not particularly active.

Quotations for caustic potash and carbonate of potash are well held, although the demand is moderate; caustic, 90 per cent. strength, is on offer at £30 to £31 per ton, and carbonate at £23 to £24. Chlorate of potash is steady and in fair inquiry at 2¾d. per lb. Yellow prussiate of potash is still quoted at 6¾d. to 7d. per lb., demand being on quietly steady lines. Bichromate of potash has met with some inquiry at 5d. per lb. for 1925 delivery. Permanganate of potash is rather quiet, with values unchanged at from 6¾d. to 7½d. per lb. according to quality.

Arsenic has shown no very perceptible improvement compared with the depressed condition of recent months, although in some quarters rather more export inquiry is reported; prices, however, are still weak at £39 to £40 per ton for white powdered, Cornish makes, delivered Manchester. Sulphate of copper is steady and in rather better demand at £24 10s. to £25 per ton, f.o.b. Acetate of lime is still quiet but unchanged in value at round £15 per ton for grey and £11 for brown. Acetate of lead is firm and in fair demand at £46 to £47 per ton for white and £43 per ton for brown. Nitrate of lead is about unchanged at £42 per ton. Commercial Epsom salts are steady and in moderate request at £4 15s. to £5 per ton; magnesium sulphate, B.P., is quoted at £6 10s.

Acids and Tar Products

Oxalic acid is still selling in small quantities at 3¾d. per lb. Tartaric and citric acids are quiet for prompt business, although some bookings for 1925 delivery have been done; citric acid is quoted at about 1s. 3¾d. per lb. and tartaric at 11½d. Acetic acid is quieter at £43 to £44 per ton for 80 per cent. commercial and £68 for glacial.

Carbolic acid continues to sell very slowly, although a slight improvement from the worst is reported; crystals are quoted at about 5¾d. per lb. and crude at about 1s. 9d. per gallon. The market for pitch is still in a hesitant condition and actual business is not very extensive; prices, however, are steadier at 47s. 6d. to 50s. per ton. Solvent naphtha is firm at 1s. 4d. to 1s. 4½d. per gallon, a fair amount of trade being done. Naphthalenes are in moderate request at £15 10s. per ton for refined and £5 and upwards for crude material. Creosote oil is about unchanged from last week at 5½d. to 5¾d. per gallon and cresylic acid at 2s. 1d. per gallon.

The Chemistry of Alloy Steels

"NOTES on Alloy Metals used in Alloy Steels" was the subject of a lecture given on Friday, November 21, by Mr. J. L. F. Vogel before the Society of Chemical Industry, at Liverpool University. Mr. Edwin Thompson, who presided, welcomed Dr. Clayton, M.P., on his re-election for Widnes, and Professor Baly on his return from the United States.

The lecturer said his chief object was to draw the attention of chemists to the wide field covered by the metallurgy of alloy steels, to the part played by chemistry in their production, and the enormous field opened to chemists. He emphasised the very large extent to which alloy steels were employed and gave instances—the construction of locomotives, ocean liners, electric plant, tramways, motor-cars, and aeroplanes. The intense concentration on the production of munitions during the war threw a strong light on the part played by these steels and by the rarer metals employed in their manufacture. The problem facing makers of ferro alloys and alloy metals for steel was that the products they supplied must contain the desired metals within comparatively narrow limits, and that they must be very free from any deleterious or even doubtful impurities. Their productions would be judged more by the physical properties of the steels produced than by the assay of the ferro alloys themselves.

Broadly speaking, ferro alloys such as ferro tungsten, ferro chrome and ferro molybdenum, which were reduced directly from the ores by electric furnace or by thermit processes, called for the purest raw materials, since the possibility of eliminating impurities in the course of manufacture was very limited. The pure metals, such as nickel, cobalt, tungsten or chromium made by isolating the oxides could be produced from considerably less pure raw materials since the impurities could be eliminated in processes of manufacture. Alloy steels complying with a specification as to physical properties could sometimes be obtained by several different mixtures, and the cost of raw materials was therefore an important consideration. In conclusion, attention was drawn to the need for improved quick methods of assay for mixtures and alloys of the various metals, and for improved processes for the production commercially of the metals and ferro alloys.

Replying to questions, the lecturer discouraged the addition of alloys to the ingot rather than to the ladle, because of the danger of segregation. In regard to stainless steel, he inferred that its effectiveness depended on the polish and repolishing. The war, he pointed out, led to the discovery of enormous deposits of tungsten and hence to the lowering of the price.

Chemistry and the Linen Industry

ON Thursday, November 20, the Belfast section of the Institute of Chemistry met at the Linen Industry Research Association's Institute, Lambeg, and inspected the various laboratories, Dr. J. Vargas Eyre spoke on "Scientific Research in Relation to the Linen Trade," with particular reference to investigations having a chemical and physical bearing. As an example of the kind of problems being studied, reference was made to the relationship which seems to exist between the condition in which the flax is harvested and the progress of the retting operation, which, in turn, determines largely the composition and behaviour of the resultant fibre. It was pointed out that at all stages of preparation—spinning, weaving, finishing, and dyeing—operations were carried out which called for knowledge of the chemical and physical properties of the materials used in order to make further advances possible. The need for the services of those who had scientific knowledge to guide some of the delicate operations in bleaching, dyeing, and finishing was held to be insufficiently appreciated.

Company News

CHLORIDE AND ELECTRICAL STORAGE CO.—An interim dividend of 5 per cent. actual, tax free, is announced on the ordinary shares.

PENNSYLVANIA WATER AND POWER CO.—For the quarter ended December 31 a dividend of $2 per share has been declared on the common shares.

SCOTTISH OILS, LTD.—The directors have declared an interim dividend of 3½ per cent., actual, less tax, on the preference shares. No interim distribution was made last year.

PARKES CHEMISTS.—The directors announce an interim dividend on the ordinary shares at the rate of 5 per cent. per annum, the same as a year ago.

THE "SHELL" TRANSPORT AND TRADING CO., LTD.—An interim dividend of 2s. per share, free of income tax, payable on January 5 to shareholders on the registers on December 1.

DE BEERS CONSOLIDATED MINES.—The net profits for the year ended June 30 were £1,441,635, and £422,584 was brought forward. A dividend of 20 per cent., free of dividend tax, on the deferred shares has already been declared, leaving £407,218 to carry forward.

BRITISH COTTON AND WOOL DYERS' ASSOCIATION.—An interim statement has been published by the directors, showing trading profits amounting to £79,596. After transferring to depreciation fund £12,500, the net profit is £53,883, making, with £39,699 brought forward, a credit balance to profit and loss account of £93,582. Directors adhere to the practice of not paying an interim dividend.

DORMAN LONG AND CO.—The accounts for the past year show that the profit amounted to £504,984, in contrast with £275,454 for the preceding twelve months. After providing for the 8 per cent. preferred ordinary share dividend, writing off £7,044 as balance of amalgamation expenses, and allocating £100,000 for depreciation, there remains £210,152 to be carried forward, as compared with £202,667 a year ago. The last time the ordinary shareholders received a dividend was in 1921, when 5 per cent. was distributed.

ANGLO-PERSIAN OIL CO., LTD.—At the annual meeting held in London on Tuesday, Sir Charles Greenway, presiding, referred to the entirely satisfactory position of their refineries. At Grangemouth the refinery, he said, which was being erected by Scottish Oils, Ltd., for dealing with Persian crude had been completed, and had for some months past been in full operation. The results had been of a most gratifying character, showing in some respects, owing to the lower average temperature and other causes, an improvement even on those obtained at Llandarcy, where a considerably larger throughput had been dealt with. The further experience gained at these refineries more than ever confirmed their anticipations in regard to the great advantages of home refining. Apart from the many other advantages the reduction in evaporation and consequent larger yield of the lighter and more valuable products, the gain from which much exceeded the original estimates, alone more than justified them in having taken what was regarded by some of their critics as a novel and dangerous departure. Another important advantage that they gained was that with the constant care and supervision which their research chemists were in a position to give at close quarters to their refining processes they were able to produce motor spirit and other products of a much better and more uniform quality than is practicable when the refining is carried on in a bad climate and thousands of miles away from the countries of consumption.

Advertising Firebricks in Italy

AN extraordinary book, composed almost entirely of art plates in half-tone, photogravure and colour processes, has been received from the Commissioner for the Federation of British Industries in Italy. The subject of this book is "V and D" refractory fire-bricks, and it has been issued by this firm's agent in Milan. The series of pictures is designed to show the strength and heat-resisting properties of these bricks and how they are distributed from Newcastle-on-Tyne, through various channels, all over Italy. As a piece of modern artistic advertising it is an unequalled production.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52 Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

450,970. For raw or partly prepared vegetable, animal and mineral substances used in manufactures not included in other classes. Class 4. Kalle and Co., Aktiengesellschaft (a company incorporated under German law), 23, Rheinstrasse, Biebrich-on-Rhine, Germany; manufacturers and merchants. August 11, 1924. (To be Associated, Sect. 24.)

450,969. For chemical substances prepared for use in medicine and pharmacy. Kalle and Co., Aktiengesellschaft (a company incorporated under German law), 23, Rheinstrasse, Biebrich-on-Rhine, Germany; manufacturers and merchants. August 11, 1924. (To be Associated, Sect. 24.)

For gas carbon black. Shawinigan, Limited, 83, Cannon Street, London, E.C.4; merchants. October 6, 1924. B452,461. User claimed from July 4, 1922. The applicants undertake that this Mark, when registered, and the Mark No. 444,504 shall be assigned or transmitted only as a whole and not separately.

448,611. For preparations of cyanide for use as an animal, insect and vermin exterminator. Class 2. American Cyanamid Co. (a corporation organised under the laws of the State of Maine, United States of America), 511, Fifth Avenue, New York City, United States of America; manufacturers. May 23, 1924. (To be Associated, Sect. 24.)

Opposition to the Registration of the following Trade Marks can be lodged up to December 26, 1924.

"ZELIO."

451,142. For chemical substances used for agricultural, horticultural, and veterinary purposes, but not including disinfectants, and not including any goods of a like kind to disinfectants. Bayer Products, Limited, 31 to 34, Basinghall Street, London, E.C.2; merchants and manufacturers. August 19, 1924.

"AKTIVINO."

452,970. For chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. Chemische Fabrik von Heyden Aktiengesellschaft (a Joint Stock Company organised under the laws of Germany), 57, Leipzigerstrasse, Radebeul, near Dresden, Germany; chemical manufacturers. October 16, 1924.

"KARAMENDA."

453,053. For chemical substances prepared for use in medicine and pharmacy. United Chemists' Association, Limited, Ucal Works, Priory Court, London Road, Cheltenham, chemists; pharmacists and chemical and pharmaceutical manufacturers. October 25, 1924.

Rubber Latex for the U.S.A.

THAT the practice of exporting Para rubber in the form of latex to the United States from British Malaya is gaining popularity is evident from statistic in the monthly returns of exports and imports. During the whole year 1923 Para rubber latex exported was valued at £13,908. Of this exports to the United Kingdom were valued at £8,942 and to the United States of America at £3,955. During the period January-July of this year the value of rubber latex exports was £52,360, of which the share of the United States was no less than £52,001. The figures are more remarkable in that there was practically no export of rubber latex in the first three months, and these values really represent exports for the four months' period April-July, 1924.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

NORRIS BROTHERS, LTD., 107/111, Moorgate Station Chambers, chemical manufacturers. (C.C., 29/11/24.) £14 4s. October 11.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CORBYN, STACEY AND CO., LTD., London, E., chemists (M., 29/11/24.) Registered November 17, £1,000 (not ex. 3rd debenture, to W. H. Robertson, Southbeech, Waldegrave Road, Bickley, chemist; general charge (subject to prior debentures). *£5,000. March 12, 1924.

DUX CHEMICAL SOLUTIONS CO., LTD., London, E. (M., 29/11/24.) Registered November 13, £11,000 debenture, to Lloyds Bank City Office Nominees, Ltd., 72, Lombard Street, E.C.; general charge. *Nil. January 3, 1924.

HALL (WILLIAM) AND CO. (MONSALL), LTD., dyers, bleachers, etc. (M., 29/11/24.) Registered October 23 (by order on terms), £1,000, £4,000 and £1,900 debentures dated April 11, 1919; June 1, 1921; and May 8, 1924; and £1,000 and £1,000 debentures dated April 11, 1919; and June 23, 1919, to Mrs. E. A. Hall, Norlands, Monsall Road, Newton Heath, and F. W. Hall, of same address; general charge; also registered October 28, £1,500 debentures dated August 25, 1916, part of £10,000; general charge. *£10,000. March 20, 1924. (See Satisfaction.)

NICHOLS CHEMICAL CO., LTD., Baxenden. (M., 29/11/24.) Registered November 10, charge to bank; charged on chemical works, Lower Booths, near Accrington. *Nil. July 8, 1924.

OSMOS SALTS, LTD., London, W.C. (M., 29/11/24.) Registered November 14, charge to bank; charged on land and factory in Dulwell Road, Teddington.

PEGG AND ELLAM JONES, LTD., Derby, paint manufacturers. (M., 29/11/24.) Registered November 6, £6,000 debentures (filed under section 93 (3) of the Companies (Consolidation) Act 1908), present issue £4,800; general charge. *Nil. August 7, 1923.

WALKERS PAINTS, LTD., London, S.W. (M., 29/11/24.) Registered November 13, charge to bank; charged on 59, Wandsworth Road, S.W. *£400. January 14, 1924.

Satisfaction

HALL (WILLIAM) AND CO. (MONSALL), LTD., dyers and bleachers. (M.S., 29/11/24.) Satisfaction registered November 14, £8,900, part of amounts registered August 5, 1916, and October 28, 1924.

London Gazette, &c.

Bankruptcy Information

WOOLLEY, John Francis, 13, Waterloo Street, Newcastle-upon-Tyne, druggists' sundriesman. (R.O., 29/11/24.) Receiving order, November 15. Debtor's petition. First meeting, December 5, 11 a.m., Official Receiver's Office, Pearl Buildings, 4, Northumberland Street, Newcastle-upon-Tyne. Public examination, December 18, 11 a.m., County Court, Westgate Road, Newcastle-upon-Tyne.

Partnership Dissolved

CHAMPION, DRUCE AND CO. (Charles Carey DRUCE, Angus Robert WALBROOK, and Herbert ROCKE), white-lead manufacturers, corroders and manufacturers, and merchants of colour, paint and varnish, etc., 35 and 36, Southgate Road, Islington, N., 423 and 425, Caledonian Road, N., and 6, Laurence Pountney Hill, E.C., by mutual consent as from November 21, 1924, so far as concerns A. R. Walbrook, who retired from the firm. Debts received and paid by C. C. Druce and H. Rocke, who continue the business.

New Companies Registered

C. AND B. P. SYNDICATE, LTD., 2, Gresham Buildings, Basinghall Street, London. To acquire patents, licences, and concessions relating to any invention for the manufacture and sale of coldphale amoa products and the emulsification of tar, etc. Nominal capital, £100 in 5s. shares.

E. GUILLEVIC AND CO., LTD., 19, St. Dunstan's Hill, London, E.C. Dealers in essential oils and all substances, products or materials required for or used in the businesses of perfumers, soap makers, druggists, manufacturing chemists, etc. Nominal capital, £35,000 in 30,000 7½ per cent. preferred ordinary shares of £1, free of tax, and 100,000 deferred shares of 1s. each.

KENFORD, LTD., 58 and 58a, Avenue Chambers, 4, Vernon Place Southampton Row, London. To prepare, manufacture and sell or deal in synthetic and other chemical substances and by-products of all kinds, etc. Nominal capital, £10,750 in 10,000 10 per cent. non-cumulative participating preference shares of £1 each and 15,000 ordinary shares of 1s. each.

REFINERS, LTD., 3, The Parsonage, Manchester. Manufacturers, refiners, importers and exporters of, agents for and dealers in, decolourising and absorbent materials and plant used for the refining of oils and spirits. Chemists, druggists, etc. Nominal capital, £4,000 in £1 shares.

WERTHEIMER AND WHITE (AUXILIARY), LTD., 64, Victoria Street, London. Manufacturers, producers, and importers of, agents for and dealers in, all kinds of heavy chemicals, etc. Nominal capital, £1,000 in £1 shares.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

CREOSOTE.—A firm of agents in Lisbon wishes to get into touch with British manufacturers of creosote for injecting railway sleepers. (Reference No. 570.)

CHEMICALS, DRUGS, ETC.—A firm in Shanghai desires to get into touch with British manufacturers of chemicals, drugs, scientific instruments, and pharmaceutical products, with a view to active co-operation in developing the Chinese market by means of advertising campaigns in Chinese. (Reference No. 547.)

Tariff Changes

AUSTRALIA.—The operation of the duty imposed on citric acid has been postponed until April 1.

NEW ZEALAND.—A Bill imposes, as from October 1, on all sugar of No. 22 colour or over (Dutch standard) and on invert sugar and invert syrup imported into the Dominion a Customs duty of ¼d. per lb.

ALGERIA.—A Presidential Decree regulates the exploitation of phosphates in Algeria. The Decree provides, *inter alia*, for the levy of a tax of 50 centimes per metric ton on commercial phosphates ready for sale which have been extracted in Algeria. This tax is not to be levied on phosphates used in the country.